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BLUE JAY

June 1982

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Cover: *White-crowned Sparrow.* *Wayne Renaud*

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VIGILANCE NEEDED IN THE GRASSLANDS

The signing of a federal-provincial agreement in the summer of 1981 brought into being the National Grasslands Park for which the Saskatchewan Natural History Society had campaigned for years. The suggestion for such a park was first made in 1957 to Winston Mair at the Society's Annual Meeting, and through the long struggle to get this idea accepted by government authorities, continuing and determined leadership was given by Dr. George F. Ledingham. It was therefore appropriate that Dr. Ledingham should receive from the National and Provincial Parks Association of Canada on 8 December 1981, its J. B. HARKIN MEDAL which is awarded to persons who have served with distinction the parks and associated conservation areas of this country. In presenting the medal to Dr. Ledingham, Robert C. Scace of the National and Provincial Parks Association read the following citation:

> FOR INSPIRING IN GENERATIONS OF CITIZENS KNOWLEDGE AND LOVE OF THE NATURAL HISTORY OF CANADA'S GREAT PLAINS, AND DEDICATING HIMSELF AS RESEARCHER, TEACHER, WRITER AND FOUNDING MEMBER OF THE SASKATCHEWAN NATURAL HISTORY SOCIETY TO THE CONSERVATION OF NATIVE GRASSLANDS IN THE PRAIRIE PROVINCES.

Mr. Scace described George Ledingham as "an individual who would most surely agree with that great landscape painter, John Constable, that 'we see nothing 'till we understand it', and who, having achieved that understanding, would selflessly pass it on to so many others by word and deed."

In his speech of acceptance, Dr. Ledingham emphasized two thoughts that seemed of primary importance to him. First was the idea that team work, in this as in all conservation causes, has to be credited for whatever successes are obtained, since one person alone can accomplish little. Second was the reminder that we cannot relax our efforts as conservationists since vigilance alone can guarantee the preservation of the grassland ecological system. *The Blue Jay* has been given the privilege of reprinting excerpts from Dr. Ledingham's acceptance speech.

"The signings in Regina, Glentworth and Val Marie on June 19, 1981, which guarantee the establishment of a Grasslands Park in the Killdeer-Val Marie area, are important," said Dr. Ledingham, "because they will change first priorities in the area from economic interests to preservation. This park is also unique because it has been obtained by a process of participatory democracy. It was proposed by the public in 1963, and during public hearings in 1976 a good majority of briefs gave reasons for the establishment of the park which was finally agreed to by federal and provincial governments at the June 19 signings. *However, implementation and development in the park will likely be a long slow process and we must all continue to work to insure that the intent of the agreement is respected* . . . .

"Now six months after the official signing which creates the national park, we are frustrated. First there is a big scheme, costing millions of dollars, which will search every possible corner of the park for oil or gas even though the chances of finding any are slim. The fragile grasslands will be marked by exploration or drilling tracks for many years. Rare plants or animals may be further decimated because there has been no detailed inventory of the area so no way of marking or guarding the most precious spots. The amount of damage and erosion caused by machines in such a search is completely unpredictable, and the search is in itself a violation against the preservation concept of this and all national parks.

"There are many other worries, such as those felt by ranchers in the area. Can they now sell to the Federal Government or will their leases expire? Will agriculture be allowed to persuade some ranchers in the area to break native grasslands and so make the land useless for national park purposes? All pro-park supporters are worried because the future of the area looks uncertain, and there is no guarantee that the grassland ecological system that the park has been established to preserve will not be destroyed.

"We are increasingly aware that man's future depends on the survival of nature, and it is surely our responsibility in Saskatchewan to preserve some of our natural heritage. Naturalists are now better organized and people generally are better informed. We must depend on their informed attitudes and concern to insist on the carrying out of the intent of the agreement which has been signed. We must hold ourselves responsible for making our governments respect this park agreement and its intent which is to preserve native grasslands and all associated native plants and animals." — Prepared by *Margaret Belcher*, 2601 Winnipeg St., Regina, Saskatchewan. S4P 1H8

Badlands in the Killdeer area

Gary W. Sei

RARE PLANTS FOUND NEAR HUDSON BAY, SASKATCHEWAN

DONALD F. HOOPER, Box 40, Somme, Saskatchewan. S0E 1N0

Greenbush Campsite is in the Northern Provincial Forest Reserve, twelve miles west of Hudson Bay, on the south side of Highway No. 3. Here on a Jackpine ridge are good camping facilities, with a camp kitchen, a well with good water, outhouses, swings and teeter-totter and a good number of picnic tables (but no electrical power).

On the west side of the campsite is a steep slope down to the Greenbush River. Along the river flat grow rich stands of Black Spruce and clumps of Speckled Alder. The river is a very cold stream that comes out of the Pasquia Hills and flows into the Red Deer River two and one-half miles south of the highway.

Southeast of the campsite, the ridge drops off into a large swampy area, which covers about two sections of land. The outer edges of the swamp are encircled by stretches of open, spongy, fenland. In these fens grow several varieties of sedges, with bog willows, and birch shrubs. Pitcher plants (*Sarracenia purpurea*) are in abundance everywhere. There must be more than one hundred acres of them! In the center of the swamp is a high sphagnum bog, which surrounds Shenigan Lake. Scattered through the bog are short trees of Black Spruce and Tamarack.

I received a letter from Dr. V. L. Harms (Curator of The W. P. Fraser Herbarium at the University of Saskatchewan, Saskatoon), saying that he was coming up our way again in July to collect plants. Les Baker and I decided to do some scouting around to try and find some interesting spots to take Vern to when he came. My brother Ron came in June to collect insects for the Provincial Museum, in Regina, so we went with him for a few days.

We arrived at Greenbush Campsite on the evening of 23 June 1981. We didn't get to sleep very early, as we stayed up with Ron, who was busy collecting moths until after midnight. About five o'clock the next morning Les and I went for a hike through the woods, the vegetation being very wet with dew. One might wonder if anything noteworthy could be found near this campsite, with a paved highway and a continuous flow of traffic. But the 24th proved to be an exceptional day, with some interesting discoveries.

Entering the open fen on the edge of the muskeg, we soon found a rare plant species. A number of Purple Louseworts (*Pedicularis macrodonta*) were growing along the tracks of an old winter road crossing the swamp. This species is rare in all three of the prairie provinces.[7] This encouraged us to look further. On the mossy hummocks where the fen and bog met, we found Round-leaved Sundews (*Drosera rotundifolia*). Further on were Swamp Pinks (*Arethusa bulbosa*), often called Dragon's Mouth Orchids. They were scattered along through the stunted tamarack in the cold bog. We counted twenty-six in all! This was spectacular, for Vern told us later that this species is so rare that prior to this no more than two to five specimens have been found in any one locality in Saskatchewan. It is then very clear that these beautiful orchids should never be picked or dug up (except very sparingly for scientific collections). Swamp Pinks range from northwestern and central Saskatchewan, east to Labrador, and south into the northern

Swamp Pink and Pitcher Plant
Ron Hooper

states. They are rare in Manitoba, and in no less than ten of the states from Minnesota eastward.[7] We returned back to camp with great excitement. After all it isn't every day that two very rare species of plants can be found before breakfast!

After breakfast, Les and I returned to the swamp and crossed over to the high bog near Shenigan Lake. Labrador Tea, Pale Laurel, Bog Rosemary and Leatherleaf were common shrubs. A few Bonaparte's Gulls were flying around, and one was sitting on its nest in the top of a Black Spruce near the shore. It looked down at us quite unconcerned as we walked by.

At the north end of the lake was a wet run with floating bog. Here, Sweet Gale was a common shrub. As we were examining and smelling its fragrant leaves, a Lesser Yellowlegs scolded and complained loudly. I am sure that there was a nest nearby. Further north was a wet fen with marshy spots. This area was very calcareous, the water puddles being bordered with a white scum. Around these puddles grew many Slender-leaved Sundews (*Drosera linearis*). As we circled the area we found that there must have been at least three acres of them! This species is rare anywhere in Canada, with only a few previous records for Saskatchewan.[7] (In July, I found more Slender-leaved Sundews in a swamp north-east of Porcupine Plain.) To the west side of the calcareous area, a good number of Oblong-leaved Sundews (*Drosera anglica*) were also found.

While at the campground, we saw a female Evening Grosbeak. As far as I know there is no nesting record yet for this species in Saskatchewan. Godfrey's breeding range for Canada is based largely on summer occurrences, as definite breeding data are relatively few. For Saskatchewan he refers to the summer sight records from the Nipawin and Somme birds lists.[2] [5] [4] I am sure that they nest in the area, because on 23 June 1981, when I was in the vicinity of the Pasquia River north of Hudson Bay, I saw a pair of Evening Grosbeaks scolding around some scattered spruce trees (they often nest in a conifer). I was unable, however, to locate the nest.

In the afternoon of 24 June 1981 we went up into the Pasquia Hills on the Fir River Road. This road leaves Highway 3 five miles west of Hudson Bay. At Mile 15, we walked west down the township cutline to an open boggy fen. In the shaded mossy woods on the way to the fen we found a few Fringed Milkworts (*Polygala paucifolia*), which are dainty flowers with pink-purple wings. This forest species is infrequent at most known localities across Saskatchewan.[7]

At the fen we found some more Purple Louseworts. We discovered later that these plants are quite abundant in the immediate area. We also found a

Fringed Milkwort Wayne C. Harris

few specimens of Meadow Bitter Cress (*Cardamine pratensis*), another rare species.[6]

On 6 July 1981, Dr. Vern Harms, the herbarium assistant, Patricia Sky, Les Baker and I returned to Greenbush Campsite. Here a great variety of species were collected for the Fraser Herbarium. The next day on 7 July 1981 we went to the fen on the Fir River Road. We were only able to collect here for two hours, because of rain, but in the short time that we were there, two important discoveries were made. In the middle of the fen a specimen of Marsh (or Swamp) Saxifrage (*Saxifraga pensylvanica*) was found. This is a new plant record for Saskatchewan. We did not expect to find this species, as it is rare in southeastern Manitoba.[6]

On the south side of the fen the water filtered through a tamarack swamp. Rich growths of horsetail were the main understory plants. In this cool, moist, shaded situation there were twelve plants of the Large Yellow Lady's Slipper (*Cypripedium calceolus* var. *pubescens*). Two specimens were collected. These were the first samples of the variety *pubescens* for the Fraser Herbarium. Compared to the Small Yellow Lady's Slipper (var. *parviflorum* Fern.), our regular type, these flowers were gigantic in size. Bernard de Vries (pers. corr. with V. L. Harms, 25 February 1982) reports other verified Saskatchewan records of the Large Yellow Lady's Slipper, filed in the Fort Qu'Appelle Herbarium, from along the Kelsey Trail near Rice River and the Otosquen Road, both localities also in the Pasquia Hills.

In November Les and I went back to the fen on the Fir River Road, to try and locate some more Marsh Saxifrage plants (they grow up to 80 cm in height). It was much easier getting around on the ice and frozen bog, than it was in the summer time. We searched over a lot of the area, but found none. However we did find a few Dock plants sticking out of the ice. I sent samples to Vern, and he identified them as Great Water Dock (*Rumex orbiculatus*). This relatively uncommon species grows in swamps and shallow water of the Boreal Forest.[6] It has been found in Saskatchewan, as far northwest as Cluff Lake.[3]

I think that our few findings indicate that there are many kinds of plants yet to be found in the Porcupine and Pasquia Hills areas.

Acknowledgement

Appreciation is expressed to Dr. Vern

Large Yellow Lady's Slipper
Wayne C. Harris

Harms for checking over this article and giving helpful suggestions.

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FUNGI PRESERVING

WALTER KRIVDA, P.O. Box 864, The Pas, Manitoba. R9A 1K8

Many of us in wandering in the woods in spring, summer or autumn find interesting fungi and wonder what are their names. For identification, specimens have to be collected and preserved. The process is surprisingly simple if the following steps are taken:

1. Collect a few of the best looking specimens. Avoid spoiled ones.
2. Lay them gills down in a basket, paper bag or box. (Do not use plastic bags!)
3. Carefully remove all the soil you can from the stem.
4. At home lay them on newspaper in an airy place.
5. Move them around a bit on the newspapers each day to prevent sticking.
6. Various larvae will emerge and die on the papers — shake them off.

   There is hardly anything known about these insects in Canada. They develop into various delicate winged flies, some are Mycetophilids, Others ???
7. In about a week the fungi will dry completely and now will last indefinitely.
8. Each kind should be placed into an envelope or you can make packets by folding writing paper. The following information should be written on each: Location — Be specific to one-half mile; date of collection; the collector.
9. Number each collection.
10. Keep a note book — jot down other information on your specimens with the collection number. Changes occur in the drying process. Record the color of any spores that may have been released by the specimen as it dried.
11. Store your specimens, standing up, in shoe boxes in a dry place. They take little space and store well anywhere books can be kept.
12. Photographing prior to drying the same specimen would enhance the value of the specimens considerably.

I would be willing to name any fungi specimens sent to me. I have used this method since 1950 and have good specimens that require a minimum of attention.

SASKATCHEWAN'S SMALLEST FLOWERING PLANTS

BRADLEY J. MUIR, 24-80 Hanbidge Crescent, Regina, Saskatchewan. S4R 6N2

By mid-summer in Saskatchewan thousands of slow moving creeks and still water bodies are covered with a thick green mat of vegetation. A close inspection reveals that this mat is composed of thousands of minute plants. These are the duckweeds of the cosmopolitan family Lemnaceae. The four genera with 28-30 species, inhabiting freshwater and rarely brackish water, represent the smallest flowering plants in the world.[1 2 3]

Three species are found in Saskatchewan. By far the most frequent and abundant is the Lesser Duckweed (*Lemna minor* L.). This, the smallest of the three, is the major component of the 'blooms' that form floating emerald carpets on prairie sloughs. Its close relative, the Ivy-leaved Duckweed (*Lemna trisulca* L.), forms a tangled lattice-work that is usually submersed and easily overlooked. While these members are generally distributed throughout the province, the third species is limited to the northern portion of Saskatchewan. The Larger Duckweed (*Spirodela polyrhiza* (L.) Schleiden) inhabits marsh and bog environments of the boreal forest.

Morphology

The most striking feature of the Lemnaceae is their simplicity. Both floral and vegetative reduction is drastic. The plants are not differentiated into leaf and stem. The individual plants are called 'fronds', however this term does not imply any relationship to the ferns. Most taxonomists believe that the portion nearest the rootlet was originally the stem (of axial origin) and the other portion originally the leaf (of foliar origin).[2]

The fronds range from roughly ovate or oblong to elongate or irregular. The largest fronds are those of the Ivy-leaved Duckweed at about 1 cm. The pale to deep green plants average only 2 mm in thickness, each being a few cells thick with large intracellular air spaces present.

The duckweeds are vascular plants, but here again structural reduction is evident. Since the plant is in contact with water over most of its surface nutrients can be absorbed through the epidermis as well as the rootlets. Translocation of nutrients and metabolites is subsequently simplified.

In the two floating species (Lesser Duckweed and Larger Duckweed) the upper epidermis is cuticularized (waxy) and not easily wetted. This and the presence of pendant rootlets keeps the plant upright and seldom if ever are they found upside down.

One to many rootlets may be present. In the Larger Duckweed each rootlet is composed of a single vascular strand and a root cap. Rootlets of the Lesser Duckweed have no vascular tissue but bear a large root cap. The Ivy-leaved Duckweed is not often found with well-developed rootlets. In the floating species rootlets originate from a furrow on the underside of the plant. Depending upon growing conditions they may reach up to 4 cm in length.

Reproduction

One re-adaptation of aquatic plants is reproduction by vegetative means. In the duckweeds this form is by far the most important. Flowers and fruit are scarce and rarely seen in most species.[1 2 3 4]

KEY TO THE DUCKWEEDS (*LEMNACEAE*) OF SASKATCHEWAN

1. a) Plants with several rootlets to a frond, reddish to purplish beneath. 4-15 dark nerves radiating from a central node, nearly oval. (Fig. 1)
.... *Spirodela polyrhiza*

1. b) Plants with one rootlet to a frond, fronds greenish on all surfaces, 1-5 obscure nerves. .... *Lemna*

2. a) Fronds 2-6 mm long, roughly ovate, usually floating on surface. (Fig. 2)
.... *Lemna minor*

2. b) Fronds 6-10 mm long, medium to long-stalked, remain attached forming zig-zag chain. (Fig. 3) .... *Lemna trisulca*

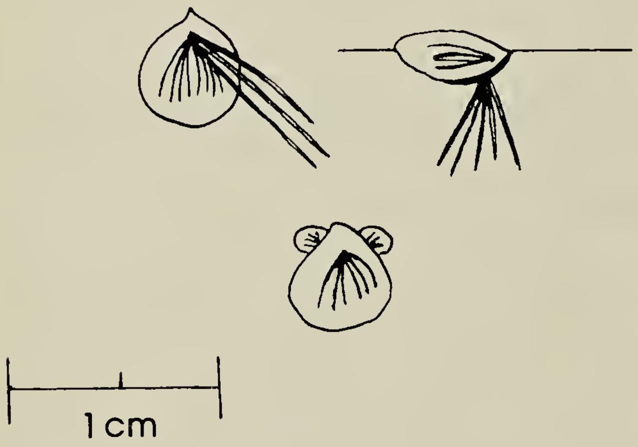

Figure 1

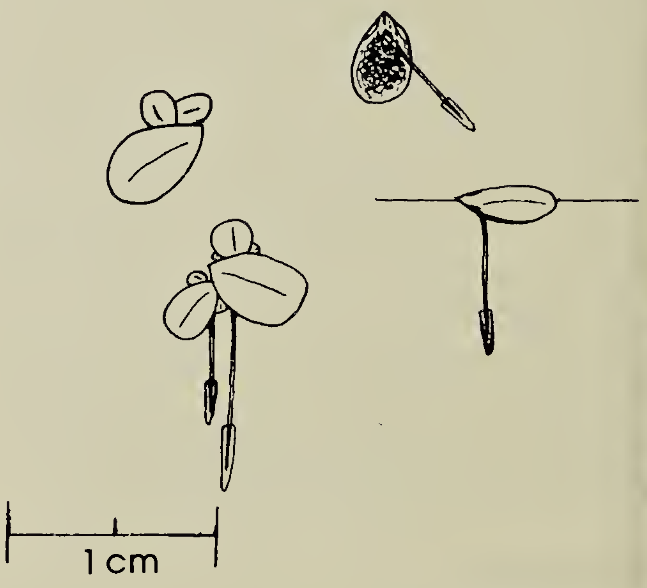

Figure 2

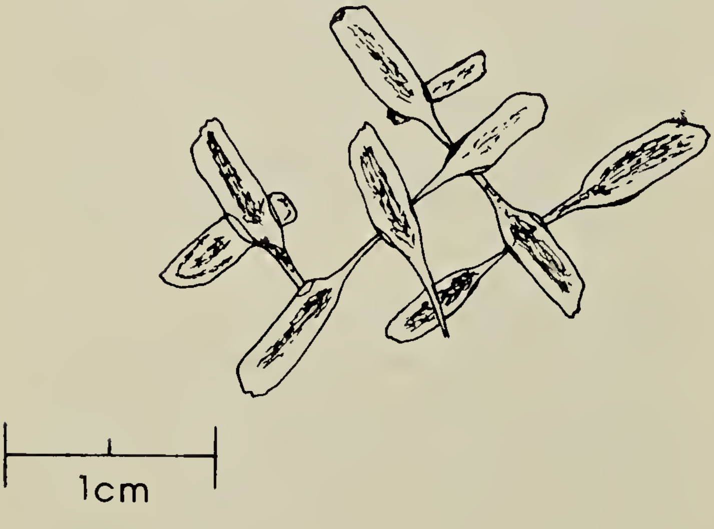

Figure 3

Normally 'daughter' fronds bud from two small membranous pockets located near the basal margin of the parent frond. (Fig. 4) The rate of growth is primarily dependent on light intensity and duration.[4] [5] [6] Under laboratory conditions frond number may double as frequently as every three or four days in the Lesser Duckweed.[6] Growth in the other two species found in Saskatchewan is not as rapid under similar conditions.

In the Lesser and Larger Duckweeds the fronds become detached and small 'colonies' of 2 to 8 fronds result. The Ivy-leaved Duckweed remains attached and colonies of 10 to 20 are not uncommon. The submerged character of this species permits budding and expansion of the zig-zag chain in three planes. The resulting networks are intricate lattices of medium to long-stalked fronds in different developmental stages.

As mentioned earlier the flowers of duckweeds are not often found. This is not only due to their rarity but also because of their size and inconspicuous colour. It literally resembles "the head of a pin" and may be overlooked or mistaken for lint or fungus.

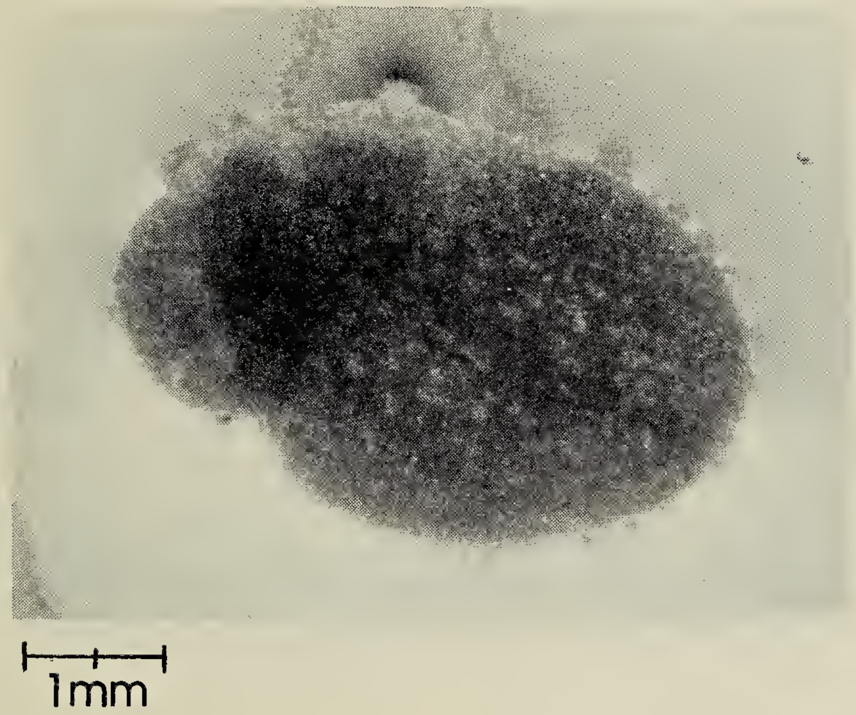

Figure 4

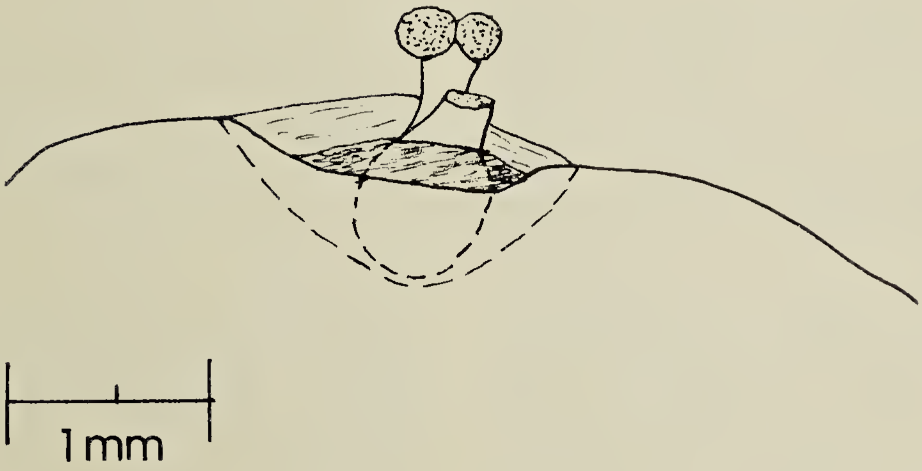

Figure 5

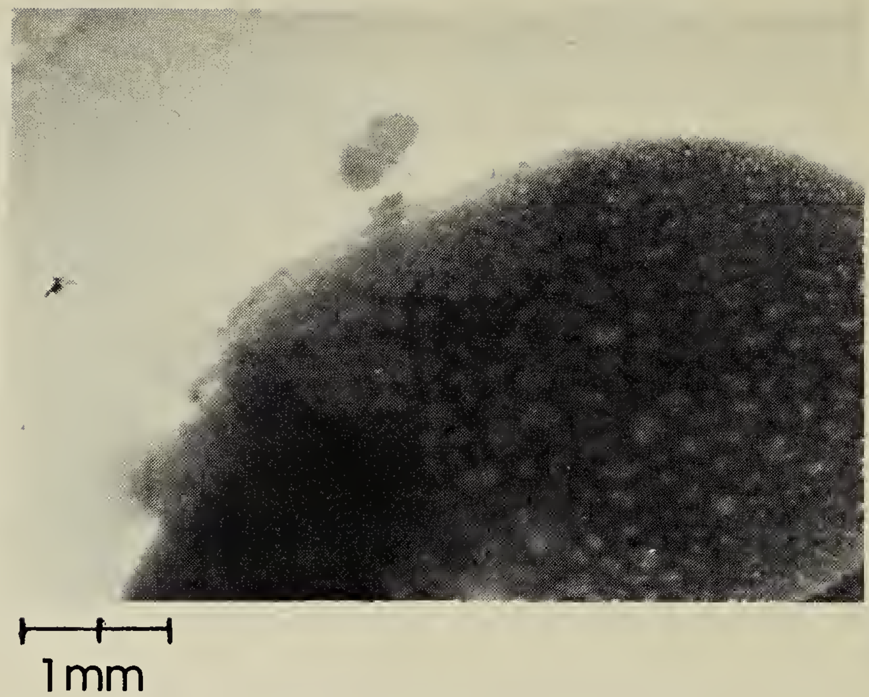

Figure 6

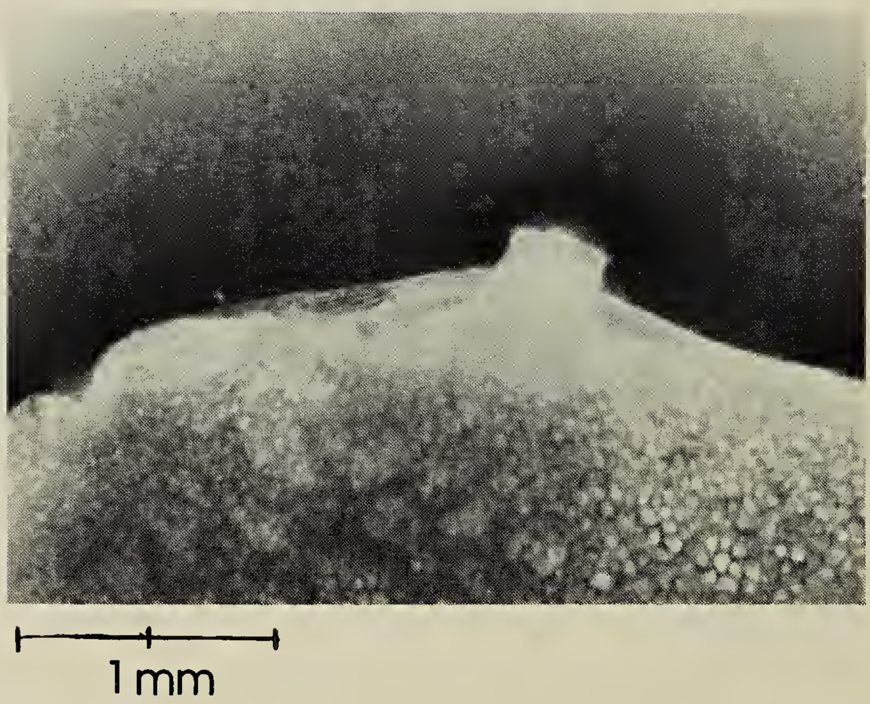

Figure 7

The inflorescence is extremely reduced with no petals or sepals. (Fig. 5) The male flowers bear one or two rigid stamens with a low output of pollen.[2] (Fig. 6) The plants are monoecious and a typical female flower appears on the same plant as a male flower but the timing of their individual maturity is staggered to prevent self-pollination. The female flower consists of a single pistil with a flask-shaped ovary. (Figs. 5 and 7) The plants are probably pollinated by insects but not exclusively because wind and physical contact are also likely pollinators since the plants are highly gregarious.[2]

The individual plants survive only a single season with overwintering accomplished as seed or by means of a modified frond called a ‘turion’. Little is known about the precise nature of these structures. In the Larger Duckweed they are darker in colour than the vegetative fronds and are somewhat kidney-shaped.[5] In autumn the air spaces become packed with starch which makes the turions heavier than water and they sink.

Ecology

In nature the duckweeds are important primary producers. Besides affecting the dissolved oxygen regime they are consumed by vegetarian fish, crustaceans and insects. Waterfowl and other marsh birds eat the plants themselves but in addition the micro-environment created by the masses of duckweeds harbors many invertebrates, in various life cycle stages, on which these vertebrates thrive.[7]

Large mammals may ingest the fronds incidentally while feeding. Certain caddis flies (Order Trichoptera) use the fronds of the Ivy-leaved Duckweed in the construction of their larval cases.

The thick carpets of duckweeds on small water bodies may inhibit evaporation thus small ponds may persist longer into the summer supporting a variety of other species.

The cycling of heavy metals in aquatic ecosystems may be in part affected by the duckweeds. Studies have shown that *Lemna minor* can accumulate significant levels of boron and can grow in media with high concentrations of boron without exhibiting phytotoxic effects.[6] [8]

The plants sometimes become nuisances in reservoirs and dug-outs as they clog pumping and filtration systems. Massive population explosions may choke sluggish waterways. The duckweeds are not susceptible to copper sulfate treatment like the algae and neither are they toxic like the algae.[9] Certain herbicides have been used effectively against dense blooms. Removal by raking is effective over small areas.[9]

In tropical countries certain species of *Lemna* along with other aquatic plants are collected and used as cattle fodder. No reports of this are known from Saskatchewan where other fodder is practically and economically more feasible. *Lemna minor* has a nutritional value reportedly similar to that of alfalfa. A danger exists in the possible use of the plants as feed in that toxic algae may contaminate the duckweed.

Duckweeds are eminently suitable for laboratory experiments. Scientists have used these diminutive monocots in mineral nutrition studies, interspecific competition studies, plant population biology, and have performed bioassays and toxicity tests with them.[10] [11] [12] [6] [8] [13]

Conclusion

The duckweeds are a well adapted and extremely successful family of aquatic plants. Their role in Saskatchewan's aquatic ecosystems is undoubtedly substantial and one which in the future may be examined both in the laboratory and in the field. Knowledgeable and observant naturalists may make significant contributions to the study of the Lemnaceae by noting the occurrence of flowering and first appearance of plants in the wild each season. Hopefully the content of this article might serve as a starting point for this work.

Acknowledgements

Much of the impetus and information for this paper was the result of my work carried out in an undergraduate research class at the University of Regina. The study reported on the phytotoxic effects of boron using *Lemna minor* L. An offshoot of this work was the detection of flowering in laboratory populations. I wish to extend thanks to my supervisor, Dr. A. Walther.

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COTTONWOOD: A RARE TREE NEAR THE PAS, MANITOBA

WALTER KRIVDA, Box 864, The Pas, Manitoba. R9A 1K8

For a quarter of a century I have been looking for the Cottonwood (*Populus deltoides*) on my various collecting trips.

I was aware of records further west in Saskatchewan and also of my own record from Riding Mountain National Park — on the highway between the North Gate of the Park and Dauphin. There is also an old report from Vermillion Park in Dauphin and The Flora of Canada identifies this report as the furthest north location in Manitoba for this species.[1]

The first local record of the Cottonwood was in the 1960's when a single tree with many dozens of suckers forming was found. This tree was found on the edge of a farm field, in the then, just opened up Pasquia settlement area about 170 miles north of Dauphin. This clone has since enlarged and is deeply entrenched, is not being disturbed and the crop is planted around it.

The second local record for the Cottonwood was made when plant collections were made on the Carrot River Road between The Pas and the Saskatchewan border, a distance of about 35 miles. Here also a single tree was found along the highway. This is a solitary tree which is not cloning.

This entire local area was heavily flooded in 1948. The water was so deep that only the cross bars on the tops of the telephone poles were visible. If *Populus deltoides* cannot stand a whole summer's drowning, it may well be that these two trees arrived as seeds after the water subsided, which would make them just short 35 years of age. It would be interesting to take increment borings to discover the actual ages of the trees.

The third and final local record, for the present, of the Cottonwood consists of several trees on the shore of Readers Lake at Wachie Bay a short walk from

Jedd Readers home. These also appear to be young trees.

In addition I have had reports of big poplar trees down the Saskatchewan River from The Pas, that have "leaves with pinking shears toothing." However these reports are not supported by voucher specimens.

The Reader Lake record is of particular interest because the trees are in pure sand on the edge of the lake. Various sand bars occur eastward from The Pas in the winding Saskatchewan River providing an ideal habitat for this poplar species. If these sand bars were explored botanically and specimens collected I am confident that additional records will be made. The species well may range into the Summer Berry Marshes.

Duplicate herbarium specimens of local *Populus deltoides* will be sent out in exchanges, to other Canadian and foreign Herbaria this year.

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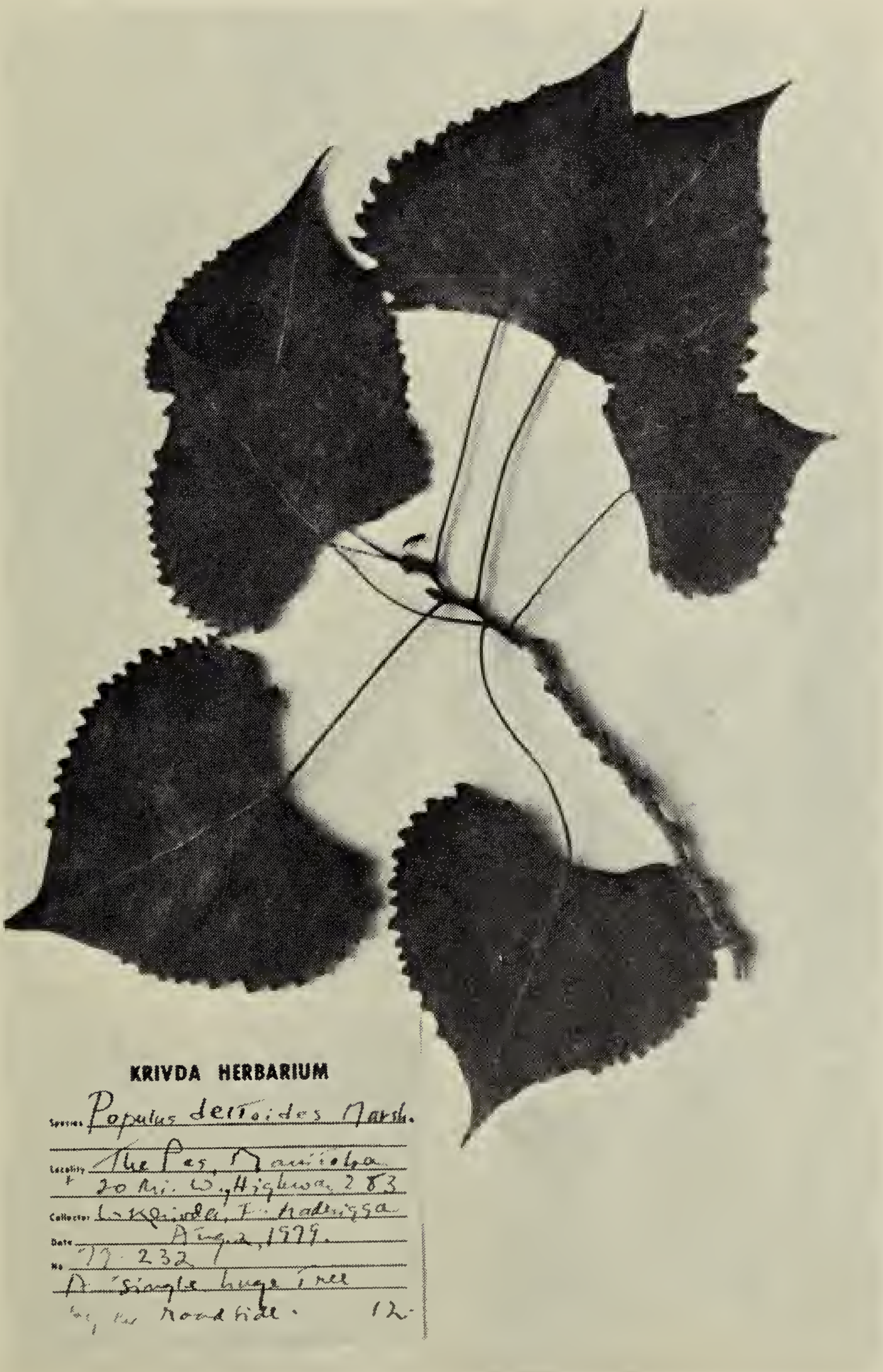

KRIVDA HERBARIUM

Species Populus deltoides Marsh.

Locality The Pas, Manitoba

+ 20 Mi. W., Highway 283

Collector W. Krivda, F. Hadwigga

Date Aug. 2, 1979.

No 79-232 1

A single huge tree by the road side. 12.

COLLECTING BEETLES IN AN ACID PITCHER PLANT BOG

RONALD R. HOOPER, Box 205, Fort Qu'Appelle, Saskatchewan. S0G 1S0

On 24 and 25 June 1981 I spent an enjoyable time for a part of two days collecting insects in a Pitcher Plant bog near Greenbush campsite, west of Hudson Bay, Saskatchewan. I was on a collecting trip for the Saskatchewan Provincial Museum, accompanied by my brother Don and his friend Les Baker, who were collecting plants.

The usual bog species of butterflies such as Bog Fritillary (*Boloria eunomia dawsoni* (Barnes and McDunnough)), Jutta Arctic (*Oeneis jutta ridingiana* (Chermock and Chermock)), and Mancinus Alpine (*Erebia disa mancinus* (Doubleday)) were present. One Grizzled Skipper (*Pyrgus centaureae freija* (Warren)) was also seen.

Day-flying moths were uncommon, so not many were taken. Dragonflies were plentiful near Shenigan Lake, including the beautiful *Ladona julia* (Uhler) which is dusted with bluish-white at the base of the thorax and abdomen.

Mosquito larvae were found in the water in the Pitcher Plant leaves and were presumably those of the Pitcher Plant Mosquito (*Weomyia smithii Coq.*)

The most noteworthy of all were the beetles. These were mostly collected by tramping the floating sphagnum moss down into the little puddles of water, and then going through the water with an aquatic net. The following is a list of the species that were taken.

Species List

GROUND BEETLES (*CARABIDAE*)

Blethisa quadricollis (Haldeman) — Three specimens in floating moss near Shenigan Lake. About 16 mm long. Black, with metallic purple sheen. Elytra indented with rows of both fine and coarse pits. First Saskatchewan record. Recorded previously in both Manitoba and Alberta.

Blethisa multipunctata (Linnaeus) — One specimen. Occasionally found in marshes throughout Saskatchewan.

Carabus chamissonis (Fischer) — Abdomen and elytra of one specimen found in a Pitcher Plant leaf. Taken previously in Saskatchewan at Waskesiu and Prince Albert.

Bembidion interventor (Lindroth) — One specimen. Apparently a stray into the bog. This species was common on dry sand among the jackpines about a half a mile farther east.

Agonum mutatum (Gemminger and Harold) — Eleven specimens in floating moss near Shenigan Lake. 8 mm long, and black in colour. First Saskatchewan record. Recorded previously (by Lindroth) west to Manitoba, and also in British Columbia and Alaska. It probably occurs in the right habitat across Northern Saskatchewan and Alberta.

Amara lacustris (LeConte) — One elytra in Pitcher Plant leaf. This common species is usually found along shores.

Chlaenius pensylvanicus (Say) — One specimen in wet moss near Shenigan Lake. This species is very common throughout Southern Saskatchewan under debris along wet shore-lines.

PREDACEOUS DIVING BEETLES (*DYTISCIDAE*)

Hygrotus sayi (Balfour-Brown) — One specimen of this common Saskatchewan species was collected.

Hydroporus rectus (Fall) — One specimen collected. Taken previously in a floating moss bog at Milliken Lake, near Uranium City.

Hydroporus striola (Gyllenhal) — Fifteen specimens. A common species of floating bogs.

Hydroporus (near) *hockingi* (Larson) — Two specimens. *H. hockingi* was named by David Larson from specimens taken in sphagnum bogs in the foothills of Alberta. More collecting needs to be done to find out if this is a different species, or a variant of *H. hockingi*.

Agabus phaeopterus (Kirby) — Three specimens. Taken previously in Saskatchewan at Patterson Lake. It should be found throughout the forested area of the province.

Agabus semipunctatus (Kirby) — Four specimens. Taken previously in Saskatchewan at Milliken Lake, near Uranium City.

Ilybius discedens (Sharp) — Sixteen specimens. Common in Northern Saskatchewan.

Dytiscus harrisii (Kirby) — One male specimen found dead. This is an uncommon species that is found across the Canadian Zone.

Dytiscus circumcinctus (Ahrens) — Elytra of two specimens of this very common species were found.

Hydaticus modestus (Sharp) — One elytron found of this occasional species.

WATER SCAVENGER BEETLES (*HYDRPHILIDAE*)

Crenitis morata (Horn) — Three specimens.

Cymbiodyta acuminata (Fall) — Eight specimens.

Cymbiodyta sp. — One specimen.

Cercyon cinctus (Smetana) — Two specimens.

ROVE BEETLES (*STAPHYLINIDAE*)

Gymnusa atra (Casey) — One specimen.

CLICK BEETLES (*ELATERIDAE*)

Ctenicera sp. — One specimen, swept from Leatherleaf.

SOLDIER BEETLES (*CANTHARIDAE*)

Cantharis sp. — Nineteen specimens from Pitcher Plant blossoms. The same species was taken on Pitcher Plants at Nipawin on 15 June 1968.

LADY BEETLES (*COCCINELLIDAE*)

Coccidula occidentalis (Horn) — One specimen, swept from Leatherleaf. This is a marsh species of the Canadian Zone.

WEEVILS (*CURCULIONIDAE*)

Hypomelyx piceus (DeG.) — The elytra and abdomen of one specimen were found in a Pitcher Plant leaf. We have previous records of this holarctic species from Somme and Waskesiu.

Acknowledgements

I am indebted to Dr. George Ball of Edmonton, Alberta, for checking the identifcation of the Ground Beetles, and to Dr. David Larson of Saint John's, Newfoundland for checking the identification of the Predaceous Diving Beetles.

Pitcher Plant *Ron Hooper*

RESPONSE OF BIRDS TO AN ECLIPSE OF THE SUN

JOHN P. MORGAN, P.O. Box 776, Dauphin, Manitoba. R7N 3B3

A sweeping black curtain engulfed the prairie in inky darkness. The horizon was an icy turquoise pallisade guarding against invasion by the sun's fire. Gusty mid-winter winds rattled snow crystals across somber fields, then ceased. The silence was demanding, overpowering. A world waited, hushed and awed, for daylight to return.

The scene was not one imagined in a science-fiction thriller or artificially created on a movie set. It was a frosty Manitoba morning, 26 February 1979: the day of the total solar eclipse, one which few will ever forget.

The eclipse, in addition to being a memorable event from a human viewpoint, was equally important to various species of overwintering birds. This most unusual natural phenomenon provided a unique opportunity to study bird behaviour. Rapidly changing light levels provided by the eclipse furnished a ready-made experiment to test the effects of photoperiod on avian activities under natural conditions.

Reports of bird behaviour were solicited throughout the eclipse path in Manitoba by ads placed in local and regional newspapers, posters, a C.B.C. radio interview and personal contact. A total of 54 people responded to the survey. The geographical area covered by observers was from Regina, Saskatchewan to Vermillion Bay, Ontario and Pilot Mound to Hodgson, Manitoba. Habitat types ranged from downtown urban, suburban yards to prairie, aspen parkland and boreal forest. Most observations were made at bird feeders.

Temperatures at eclipse time (1046 C.S.T.) were −11°C in Winnipeg, −13°C in Brandon and −18°C in Dauphin (Atmospheric Environment Service, personal communication). Winds were light (13 to 19 km/h) and all three stations reported a thin overcast of cirrus clouds. The eclipse did not result in any significant changes in weather patterns in those locales.

The 54 respondents provided 105 separate observations on 25 bird species. They provided a representative cross section of the winter birds normally present in Manitoba.

SHARP-TAILED GROUSE

Two reports of Sharp-tails were received, both from rural areas. At Fraserwood, a flock of 15 flew in from east of the observer. They landed on top of a row of hay bales two minutes before totality. The birds were very active and nervous, clucking continually throughout the eclipse. Immediately after the sun reappeared the grouse flew south towards a woodlot. Two grouse feeding in a Headingly back yard became very alert as the darkness increased. They walked part way up a one meter high earth mound and flew away just after totality.

ROCK DOVE

Six observations of Rock Doves (more commonly known as domestic pigeons) were reported. In Pilot Mound, St. Laurent, and downtown Winnipeg, totality caught three flocks of doves in flight. They exhibited erratic flight patterns apparently becoming confused and disoriented. Doves were also seen to roost on buildings, beginning five to ten minutes before totality till up to 12 minutes after. They showed typical roosting behaviour: huddling together with bills tucked in their scapular feathers. A third type of behaviour was demonstrated by still other urban Rock Doves. These birds continued flying normally throughout the eclipse, displaying no obvious reaction to it.

MOURNING DOVES

Two Mourning Doves overwintering in Carman became very active just before totality, then went to roost on a rooftop, remaining motionless until sunlight returned. At this time they began to hop around and finally flew off.

GREAT HORNED OWL

A tamarack bog near Hodgson revealed two owls that began hooting four minutes before totality and continued until one minute before totality. One bird hooted three times, the other two. The owls were approximately 200 meters apart. In the Spruce Woods and at Lac du Bonnett, single Great Horned Owls were heard calling during and after totality.

SNOWY OWL

A lone Snowy Owl was observed by several people in the industrial area of northwestern Winnipeg coming to feed on a dead White-tailed Jackrabbit during totality. The rabbit was thought to be the owl's own kill. As the sun returned, the Snowy Owl stopped feeding and flew off.

GREAT GRAY OWL

Five observers in the Lac du Bonnett area reported on the behaviour of 20 Great Gray Owls seen the morning of the eclipse. One flew out from its perch three times in large circles prior to totality. During the eclipse, it sat still on top of a telephone pole. Most of the other owls were seen on high perches. The most noteworthy aspect of the observations was that it was very unusual to see that many owls out during an otherwise bright (except for the eclipse) winter day.

RED-HEADED WOODPECKER

This species was recorded at two feeders in southern Manitoba. Both individuals exhibited behaviours normally associated with dusk and dawn. They flew off to roost a few minutes before totality, then returned to their feeders as daylight increased.

HAIRY WOODPECKER

A Hairy Woodpecker stayed at a feeder in Baldur until seconds before totality, returning quickly after the sun reappeared.

DOWNY WOODPECKER

This smallest resident woodpecker was seen to react similarly to the Red-headed Woodpeckers at two feeders. A third Downy, however, remained at an Anola feeder throughout the eclipse. It did not interrupt normal feeding activities, apparently oblivious to the lighting conditions.

BLUE JAY

Eight accounts of Blue Jays were received from widely scattered areas of the province. Four noted the typical nightfall roosting and daybreak return to feeding behaviours seen in other species. In Cypress River, this pattern also was followed with the exception that upon coming back to the feeder, the jays vocalized on a window sill rather than their usual treetop perches. Blue Jays in Stonewall left their feeder as it became dark. They "screamed" loudly throughout totality, returning about ten minutes later. Seven jays in Pinawa flew west from a feeder to a nearby wooded area two minutes before totality. When observations ceased one half hour later, they still had not reappeared. A lone Blue Jay at a Brandon feeder remained throughout the eclipse, even though a flock of House Sparrows left the same feeder as it darkened.

GRAY JAY

Four Gray Jays at a feeder near

Wallace Lake exhibited noticeably greater than normal activity in the 35 minutes preceding the eclipse. All left the feeder by eight minutes before totality and were silent. The only exception was a single whistle heard four minutes before totality. Normal activities about the feeder resumed approximately 11 minutes after the sun reappeared.

BLACK-BILLED MAGPIE

A single magpie at a feeder in Amaranth was observed to feed amicably with several Black-capped Chickadees, Blue Jays and woodpeckers. This was noteworthy as the different species did not usually tolerate each others' presence and normally fed at different times. The morning of the eclipse, however, they all arrived at the same time. No inter-specific aggression was seen. The birds "ate as though it was their last meal". All departed before totality with only the Chickadees returning later that afternoon.

COMMON RAVEN

Five ravens flying north over a runway at the Winnipeg airport dipped sharply down and to the east (as if they had been physically hit) when the shadow of the eclipse passed them. They then continued flying north, but at a lower altitude than previously. One raven perched on a dead spruce tree in a tamarack bog near Hodgson for at least 30 minutes before totality then 45 minutes afterwards until observations ceased. It had no apparent reaction to the eclipse, although its behaviour was not observable during the darkest part of totality.

COMMON CROW

One crow was noted flying east to west over downtown Winnipeg, cawing, just prior to totality.

BLACK-CAPPED CHICKADEE

A total of 11 accounts of this species was received. Seven indicated Chickadees at feeders left the area as

Black-billed Magpie *Juhachi Asai*

darkness increased, returning as light levels became more normal. At Wallace Lake, up to five were unusually active until stopping abruptly just prior to totality. They returned from roosting 15 minutes later. In Pinawa, two chickadees fed right up till totality, flew off to a white spruce 2 m away where they sat quietly through the eclipse, and came back to feed within seconds of the sun's reappearance. The usual flock of Chickadees at an Anola feeder was conspicuous by its absence 26 February. Not one appeared there during that day. An unknown number of Black-capped Chickadees (probably less than ten) were heard vocalizing in an interlake tamarack bog. The calls sounded similar to the ones normally given in the early morning, and lasted from two till 12 minutes after totality. Chickadees at a feeder in Vermillion Bay, Ontario, remained throughout the eclipse, along with several White-breasted Nuthatches.

WHITE-BREASTED NUTHATCH

Three observations of nuthatches at feeders noted them flying off to roost as darkness increased, returning sometime after the eclipse. A pair observed in Assiniboine Park appeared unusually active and vocal prior to totality. They were not seen afterwards. Nuthatches at a Vermillion Bay feeder remained throughout totality with a flock of Black-capped Chickadees, even though Evening Grosbeaks in the vicinity left to roost.

BOHEMIAN WAXWING

Twenty Bohemian Waxwings flew from west to east across the eclipsed sun in downtown Winnipeg. Another four were observed perched in a tree, fluffed up with bills tucked in scapular feathers as totality approached. They then flew off after the sun came out.

STARLING

Both reports of this species have it flying off to roost before the eclipse, and

Bohemian Waxwing

Kathleen Morck

returning to feeders as light levels increased once again.

HOUSE SPARROW

This familiar resident was reported from 15 locales throughout the province. Nearly all (14) observations were of flocks flying off to roost as the sun's light waned, returning to normal activities fairly quickly after the eclipse. Two flocks went to multicelled Purple Martin houses, which are customary nighttime roosts for House Sparrows in winter. Others roosted in evergreen trees, which are also usual nighttime roosts. Several observers noted a significant increase in vocalizations just before and after totality. This phenomenon is usually shown by sparrows at dawn and dusk. One group was heard to give alarm calls as the light decreased. In Stonewall, a female House Sparrow was recorded flying frantically south to north (as if being pursued) during totality to a spruce tree. Here it quickly settled down to roost. Sparrows in St. Eustache were observed flying erratically and hitting a building during totality.

EVENING GROSBEAK

Eight reports of Evening Grosbeaks were received. Seven feeders had grosbeaks leaving to roost during the pre-eclipse darkening and returning at varying times after totality. Generally, this species appeared to leave earlier and return later than other birds. One observer noted the grosbeaks beginning to get quite lazy at three quarters totality, but still feeding for a few minutes before flying off to roost. In Kelwood, a flock flew around erratically before totality, finally settling down to roost in a spruce tree. They were more vocal afterwards, and fed voraciously. Forty to 50 from a Pinawa feeder flocked together and headed southeast to a clump of spruce and balsam fir approximately two minutes before totality. Large flocks came from all directions to this clump, apparently using it as a communal roost during the eclipse. When observations ceased one half hour later, no grosbeaks had returned to the original feeder.

PINE GROSBEAK

One report of several Pine Grosbeaks at a feeder had the birds flying off to roost as totality approached. They then returned to feed as light levels became more normal.

REDPOLL SPECIES

This species was recorded at six locales on eclipse day. In four areas, redpolls at feeders left to roost as light levels began to decrease noticeably. They resumed normal activities fairly rapidly after totality. In Pinawa, six redpolls flew off from a feeder to roost in a clump of spruce, fir, birch and willow 20 m away two minutes before totality. When observations ceased one half hour later, none had yet returned to feed. A flock estimated to be between five and ten individuals in an interlake tamarack bog began singing two minutes after totality. They continued singing for ten minutes. The calls sounded identical to those given by redpolls in the early morning after sunrise. Observers had been in the area 30 minutes before the eclipse, but did not hear or see any redpolls until after the sun returned.

PINE SISKIN

A lone Pine Siskin at a rural feeder was recorded flying off to roost with several other species before the eclipse. It then returned with them to feed as the light became brighter.

DARK-EYED JUNCO

Two juncos overwintering at a downtown Winnipeg feeder reacted similarly to other birds: departing to roost as totality approached, coming back to the feeder as light levels returned to normal.

SNOW BUNTING

This common winter resident was recorded twice on eclipse day. At one rural feeder, a Snow Bunting flew off to roost before totality and returned afterwards. A flock of 25 was observed in a field near Fraserwood. They landed just south of a row of hay bales before totality, chirping and hopping around, making an unusual amount of noise. After roughly two minutes, the flock got up and circled the field, apparently restless. No activity was recorded during the eclipse. Afterwards, they were seen flying around the field again, vocalizing frequently.

Discussion

The 105 observations of various species provided some interesting insights into some of the mechanisms of avian behaviour. By far the most common reaction exhibited by the greatest number of birds (18 species/53 observations) was roosting during totality and for varying periods before and after it. This comes as little surprise as the direct influence of photo-period on birds has been well documented. Changes in light levels throughout the day are known to affect singing, feeding, and activity rates.[4] Approaching darkness in the evening generally stimulates roosting behaviour in diurnal species. Similarly, increasing light levels in the morning signals the return to normal activities.

The bulk of the birds observed on eclipse day reacted just as they would have to nightfall and dawn. Roosting began up to 12 minutes before totality and lasted for varying lengths of time afterwards. Although the eclipse occurred less than three hours after sunrise, most birds seemed to accept it as signalling the end of a very brief "day" and prepared to roost. The rapid return to daylight a short time later brought most back to whatever they had been doing beforehand.

Several observers reported the departure before totality and subsequent arrival of birds after the eclipse followed the normal daily schedule shown by various species at feeders. As anyone who has ever watched a feeder closely knows, different species generally arrive and depart at certain times of the morning and evening. The timing of a given species is often so predictable that one can set his watch by their comings and goings. It is significant to note that a highly unusual event such as an eclipse did not alter the usual patterns of when feeding ended and began.

A striking example of response to the eclipse by a nocturnal species, the Great Horned Owl, also reflects the important role light regime plays in regulating bird behaviour. While most other birds were going off to roost as the eclipse approached, four owls began hooting. These calls are normally given at dusk, or on days with heavy overcast. As in the diurnal species that went off to roost, the owls were "fooled" into believing night was descending.

Another species of owl, the Great Gray, appeared to react to the lower light levels of both the partial and total phases of the eclipse. This species is most often observed on bright days at dawn and dusk, and when the sky is overcast.[3] On the morning of 26 February, an unusually large number of Great Gray Owls (20) was observed for a sunny day. Their increased activity was seemingly due to the lower than normal light levels provided before, during, and after the eclipse. It appeared they were demonstrating an instinctive reaction to the change in photoperiod.

Not all birds, however, demonstrated a simple instinctive reaction to the changing light levels of the eclipse. Ten species were recorded as obviously reacting to the eclipse. Two (Rock Dove and House Sparrow) became disoriented in flight. Eight species responded with behaviours ranging from general nervousness and increased vocalizations (Sharp-tailed Grouse, Blue Jay, Common Crow, White-breasted Nuthatch, House Sparrow, and Snow Bunting), to peculiar flight patterns (Common Raven) and conspicuous absence from a feeder (Black-capped Chickadee). These birds evidently sensed something was amiss and did not simply go to roost.

One plausible explanation for these behaviours is the internal conflict between the urge to roost with approaching darkness and the endogenous 24 hour "clock" which regulates some avian behaviours.[4] The peculiar eclipse situation which created nearly total darkness during mid-morning could have stimulated the two opposing instincts, resulting in seemingly incongruous displacement activities. More detailed information would be necessary, however, to demonstrate conclusively that this did occur during the 1979 eclipse.

Six species were observed to totally ignore the eclipse phenomenon. One observation each of Rock Dove, Downy Woodpecker, Blue Jay, Common Raven, Black-capped Chickadee and White-breasted Nuthatch documented individuals continuing normal activities as if nothing extraordinary was taking place. These birds apparently relied upon their internal clocks to tell them that it would not be nighttime yet, and continued, unmoved, on their daily tasks.

A study of the 20 July 1963 total solar eclipse in Saskatchewan found singing rates increased markedly before and after totality. There was almost a complete absence of activity during the time the sun disappeared.[2] Resumption of normal behaviours was gradual and varied from species to species. Cliff Swallows showed increased feeding activities after the eclipse.

Results from the present study also show increased vocalizations of many species in response to the varying light levels. The birds in both cases were apparently demonstrating the instinctive drive to sing under conditions that approximated dusk and dawn. The increase in feeding rate shown by Cliff Swallows in Saskatchewan similarly was demonstrated by a flock of Evening Grosbeaks at a Kelwood feeder in the 1979 eclipse. Reasons for this intensive feeding behaviour are unclear, but it may reflect the uncertainty brought about by this highly irregular event.

Since a total solar eclipse happens relatively infrequently and lasts for only a few minutes at a given location, natural selection would not be expected to provide instinctive mechanisms to cope with it. Birds are left to their own devices to deal with the situation. The resulting intra and interspecific variation in response shows the confusion which can result from circumstances that do not fit normal daily or seasonal routines.

This variation was also noted by Elliot and Elliot who studied singing rates of warblers and sparrows during the 10 July 1972 total solar eclipse in Nova Scotia.[1] Species there mainly responded to the external control of light levels and demonstrated behaviours characteristic of dusk and dawn. Some, however, exhibited an internal control over song rates, suggesting the 24 hour clock or circadian rhythm was responsible for triggering behaviours. Although the two earlier studies are not directly comparable to the present one due to different methods and the times of year involved, it is significant to note that similar results were found and conclusions reached.

Additional research is evidently necesssary to more clearly define the role that light regimes and internal rhythms play in avian behaviour. This study indicated the importance of both in birds' lives. Just as importantly, it showed the contribution that can be made by people from all walks of life to basic science.

Acknowledgements:

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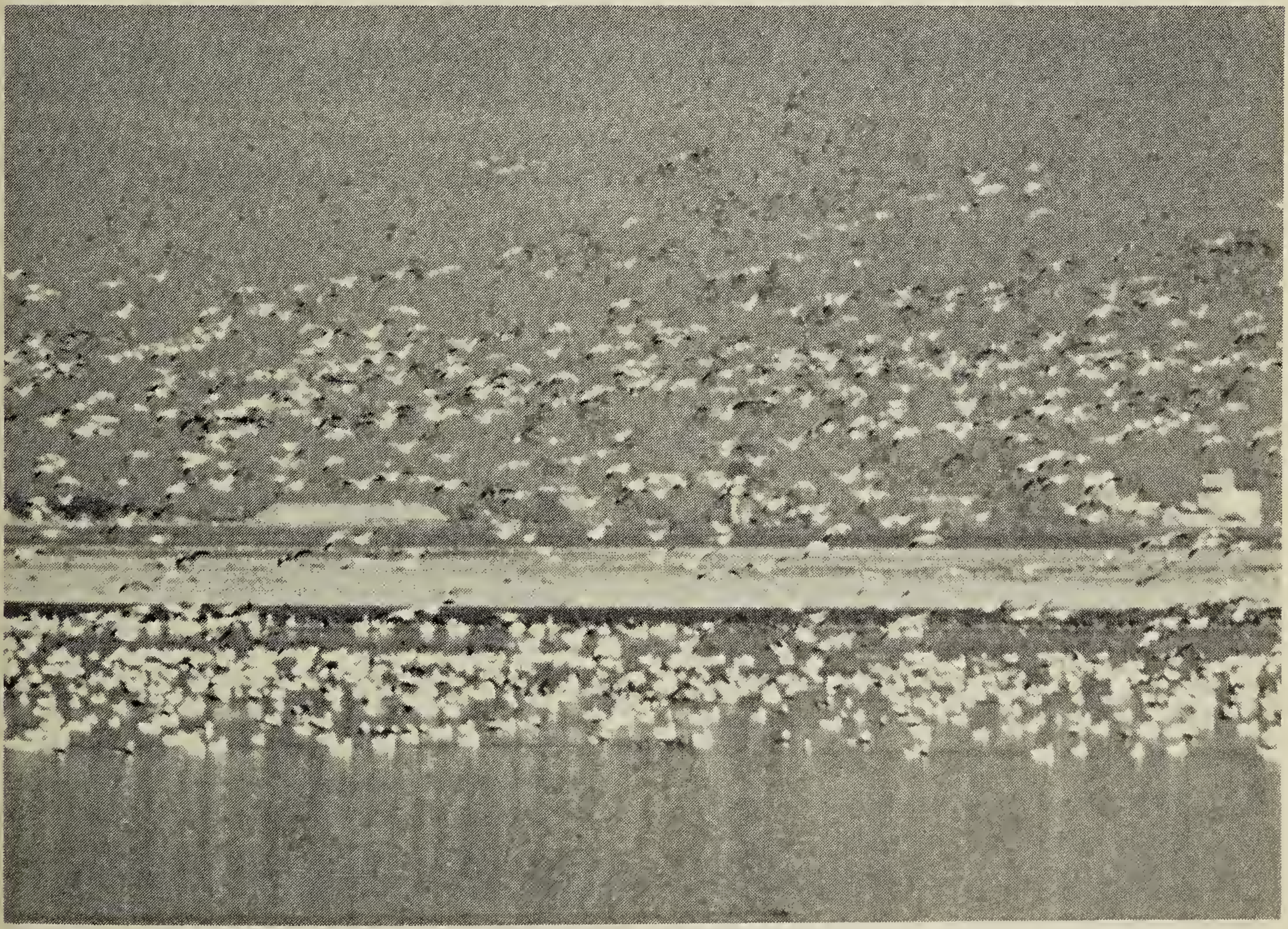

Snow Geese on Buck Lake *Chris Adam*

NOTES ON THE BIRDS OF THE WOLLASTON LAKE REGION, SASKATCHEWAN, SUMMER, 1977

D. M. SECOY, Biology Department, University of Regina, Regina, Saskatchewan. S4S 0A2 and ERIC MAW, Zoology Department, University of Alberta, Edmonton, Alberta. T6G 2E2

In the field work preceeding the writing of *The Birds of Northeastern Saskatchewan,* one of the areas visited by Nero and his assistants to determine the southern limits of the transitional zone of the boreal forest was the Wollaston Lake region.[5] An opportunity arose for us to visit the region in the summer of 1977. Maw spent the entire summer, 28 May to 16 August, in the area observing birds and collecting insects and plant specimens. Secoy visited the area from 13 to 15 July. The summer base was a Department of Mineral Resources camp located on Boland Lake, a small lake at the southwest margin of Wollaston Lake (Fig. 1).

Regular traverses were made in the vicinity of Boland Lake to determine the species present and gain some information on the productivity of the area. Flights into a number of other small lakes, named in Fig. 1, allowed additional field work within the area from 57°30' to 58°00' N and 103°00' to 104°00' W.

As Nero has noted, there is a variety of habitats in the Wollaston Lake region.[5] South of Wollaston, rock outcrops are few, much of the area being covered by compact sand. Black Spruce predominates in both open and closed stands, with an admixture of Jack Pine. The proportion of pine and the density of trees varies with fire history, age of stand and drainage conditions. A few limited, higher, dry areas are occupied by persistant pure stands of Jack Pine. The extensive low-lying areas are covered primarily by spruce-sphagnum bog. Birch, alder, willows and some spruce line the banks of small water courses and lake shores. Dense stands of emergent Sedge (*Carex* sp.) occur in shallow bays and protected lake margins. The mouths of the many slow-moving streams support large, dissected Sedge-Buckbean (*Carex-Menyanthes*) floating marshes. A large esker forms the eastern margin of Boland Lake, with signs of bear, wolf and caribou attesting to its use as a trail.

Of the 77 species seen in the summer of 1977, 21 had not been reported by Nero from this area. These species are indicated by an asterisk (*). No specimens were collected.

Species List

COMMON LOON. Common. Seen from 28 May to 8 August. A pair on each small lake and several on the larger lakes. Three nests of small heaps of grasses or sedge found on lakeshore margins, each with either 2 eggs or chicks. First downy young seen 27 June, the last 29 July. One nest lost to a seiche (change in water level). Immatures first seen 6 August. Response to an overflight by a Bald Eagle consisted of both adults calling and one circling on the water near the young with its wings spread.

AMERICAN BITTERN*. Singles seen or heard from 30 May to 26 June in shoreline marshes of Boland Lake.

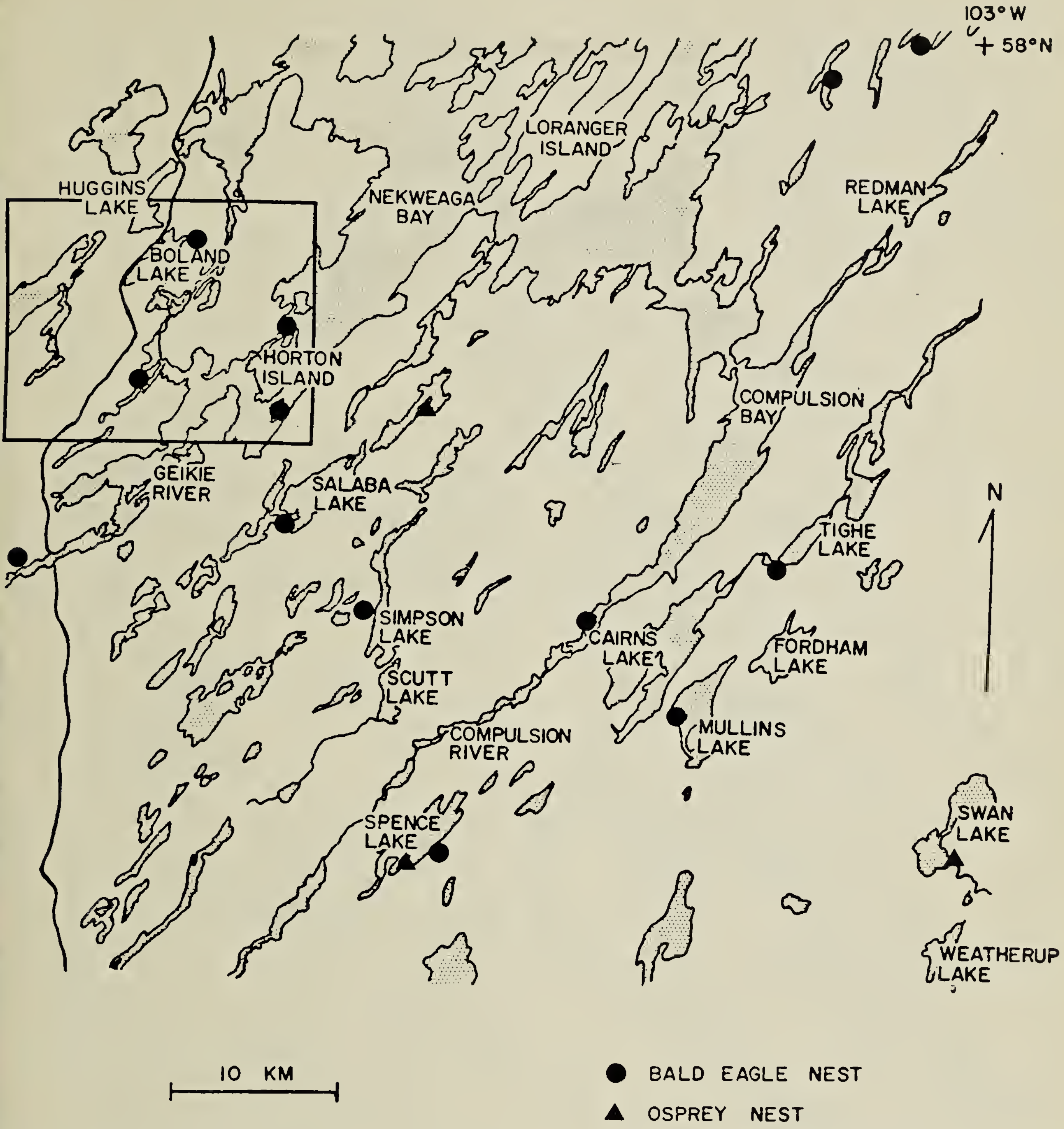

Figure 1. *Map of the southern end of Wollaston Lake, showing the lakes mentioned in the text. Known Bald Eagle and Osprey nests are indicated. The area outlined is shown in greater detail in Figure 2.*

CANADA GOOSE. Groups of 2 to 100 flew in from Wollaston Lake to feed around Boland Lake throughout the summer.

MALLARD. Seen from 4 June to 16 August around Boland Lake. Four broods known (nests with 10 and 11 eggs, two broods of 7 and 9 downy young). Known hatching dates were 15 June and 2 July.

AMERICAN GREEN-WINGED TEAL. On 13 June, 6 males feeding in sedge marshes on shore of Boland. Single female flushed on a small pond nearby.

BLUE-WINGED TEAL.* Singles, pairs and small groups of males (2-7) from 12 June to 16 August on Boland.

AMERICAN WIGEON. Pair feeding in marsh on Boland Lake 5 June.

GREATER SCAUP.* A pair of ducks seen 13 July on a pond near the large esker were identified as this species. The birds were feeding and grooming so that there was ample opportunity for both Maw and Secoy to note the characteristic light primary stripe and the sharp distinction between dark breast

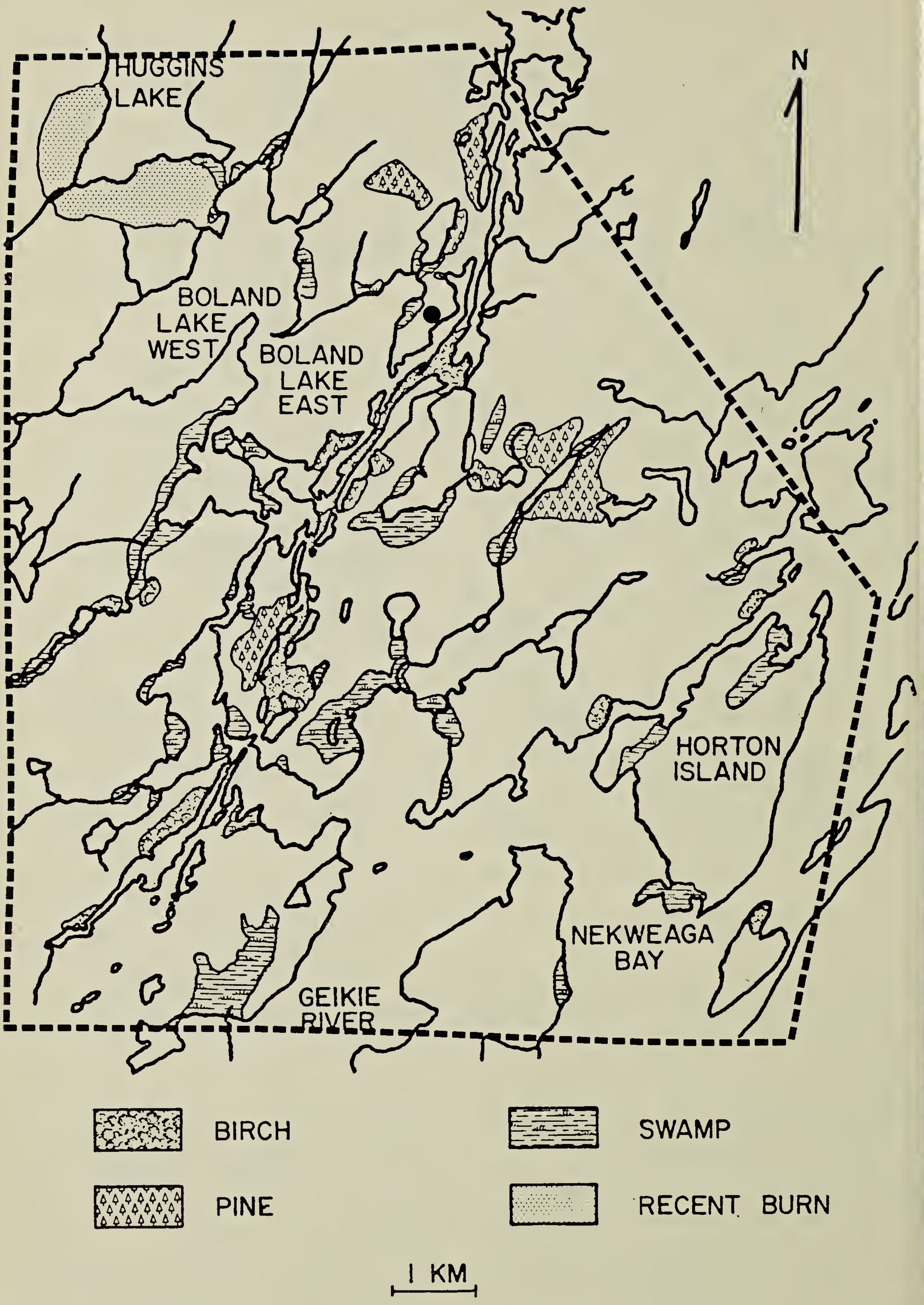

Figure 2. *Map of the Boland Lake camp area. Unless indicated otherwise, the area within the outline is covered with spruce, either in pure stands or mixed with pine or birch. The camp site is indicated by a circle.*

and light side and belly on the male. Head colour could not be distinguished. This species has been considered in recent times to occur in Saskatchewan only as a sporadic, occasional migrant. Houston and Street believed the species to be erratic in northern Saskatchewan.[3] Nero discussed them as a possible breeder in the Lake Athabasca region and northern Saskatchewan.[4]

LESSER SCAUP. Small groups (1-5) of males on several lakes between 1 June and 10 July. Pair seen 7 July on Boland Lake.

BUFFLEHEAD. Seen from 7 June to 5 August. Four broods of 4, 6, 7, and 11 young seen on small ponds in the area. One brood known to hatch 20 June.

WHITE-WINGED SCOTER. Pair and 2 large young on Boland 13 July. Six on another small lake 25 July.

SURF SCOTER. Courtship on Boland Lake 5 June. Two broods, of 6 and 8 downy young on small pond 7 July near Mullins Lake. A group of 6 immatures on Swan Lake 29 July.

COMMON MERGANSER. Three males and 6 females in the rapids of a small stream entering Boland Lake 7 June. One shore-line nest of a shallow grass-lined depression with 6 eggs at Mullins Lake was destroyed by a seiche 5 July. Downy young in broods of 6 and 9 were seen 24 and 26 July, the latter in the lowest rapids of the Geikie River. Groups (4, 7) of large immatures seen 24 and 26 July.

RED-BREASTED MERGANSER. Several pairs and small groups (2, 5) of females on Boland from 5 June to 16 July.

GOSHAWK.* A female and 2 young seen a number of times during the summer along the north shore of Boland. Fed on Spruce Grouse and Northern Waterthrush (?). Chased by Common Terns; chased a large buteo (Red-tailed Hawk?).

RED-TAILED HAWK. One adult seen at Lake, 58° N 103° W, 23 July; one near Boland 5 August. One possible 4 August near Boland Lake, chased by Goshawk.

BALD EAGLE. Bald Eagles seen at 13 places during the summer (see Fig. 1). Nine nests found; at least 4 were active. One nest with 1 young, others with 2. Boland Lake nest with 2 young: downy 17 June; by 20 June sitting on the edge of the nest and one-half the size of the adults; complete juvenal feathering by 14 July; not seen to fly. Young from another nest flying by 6 August. Young fed on rabbits and fish. In conflict with Osprey, American Kestrel, Herring Gulls, Common Terns, Ravens and Red-winged Blackbirds, all of which dominated the eagles.

MARSH HAWK.* A pair on Boland hunted through the summer over the marshes. Four seen playing over spruce woods east of Boland 27 July (pair plus 2 young?). Single animal over the same spruce woods 27 July.

OSPREY. Ospreys were seen at four lakes, but no young seen (Fig. 1).

MERLIN. Dead male at Mullins Lake 7 July.

AMERICAN KESTREL. On 29 July, male chased a Bald Eagle near the lowest rapids on the Geikie River.

SPRUCE GROUSE. Seen in every area visited. Chicks seen from 16 June until early July, young first seen flying on 13 July. Total of 12 broods with 1-7 young (av. 3.75).

SORA.* One at Boland 12 June in large marsh. On 15 June, found nest lined with sedges, and eggs (12) matching description in Harrison in same marsh.[2]

COMMON SNIPE. Singles seen from 12 June to 10 August in *Carex-salix* marshes around Boland. Pair seen 24 July.

SPOTTED SANDPIPER. Single birds on the camp dock, sporadically through the summer. Pairs seen in streams in the area. Single bird on rocks on shore of Mullins Lake 8 July.

SOLITARY SANDPIPER. Singles feeding and apparently defending nests in black spruce bogs at several small lakes through the summer.

GREATER YELLOWLEGS. Pairs and groups of 8 and 14 at several lakes 4-14 June. In July, nest defense behaviour of calling and circling flight in spruce bogs.

LESSER YELLOWLEGS. Seen sporadically from 13 June to 25 July at Boland and

Mullins Lakes feeding in shallow marshes.

WHITE-RUMPED SANDPIPER.* A small sandpiper feeding in the mud at Boland Lake 2 July had a white rump and upper tail coverts and is tentatively identified as this species.

BAIRD'S SANDPIPER.* Five small sandpipers flying over a marsh near Boland Lake 8 August are tentatively identified as this species.

WILSON'S PHALAROPE.* Seen several times in June and July in the Boland Lake area. Singles of both sexes, pairs, and a pair with immature were seen. This is a northward extension from the typical breeding range in the prairie sloughs, although they have also been reported in boreal lakes farther south (Kazan Lake).[6]

HERRING GULL. Nesting in the lakes which had exposed rocky islands, such as Redman and Swan. Seen nesting in trees at Mullins Lake. Downy young seen from 8 to 29 July.

MEW GULL. Seen through the summer at Boland, Huggins and Mullins Lakes. Three empty stick nests found at Huggins Lake 30 June.

BONAPARTE'S GULL. Seen sporadically over the summer at Boland and small lakes in the vicinity, and the river between Cairns and Tighe Lakes. Seen resting in spruce bogs and hawking over the lake surface after emerging mayflies.

COMMON TERN. Small groups (1-4) at Boland and small lakes in the area from 28 May to 10 August.

ARCTIC TERN.* Single bird on the large marsh at Boland Lake 12 June.

BOREAL OWL.* Pair found roosting in an abandoned raven's nest on a cliff south of Scutt Lake 15 June.

COMMON NIGHTHAWK. Courtship seen on an open sandy area near camp 6 June with 6 males courting a single female. A nest south of Boland Lake in an open pine stand had 2 eggs on 22 June. The female flew around a 20-m circle of the nest while it was being examined. A second nest 1 July had a pipped egg and a wet young. Females with a distraction display of spread, fluttering wings and clicking croak. Another female with fledged young 22 July used the same display.

BELTED KINGFISHER. Two burrows found at Boland Lake, at least one occupied. Birds seen also at Salaba and Swan Lakes, Nekweaga Bay and the lowest rapids on the Geikie River.

COMMON FLICKER. Pair seen sporadically through the summer in the spruce stands at the north end of Boland Lake raised a brood which were seen as immatures 7 August. Other birds were seen in spruce south of Boland and near Swan Lake.

NORTHERN THREE-TOED WOODPECKER. Single females and pairs in spruce or birch stands at Boland, Spence, Huggins and Swan Lakes. On 19 June, a pair seen feeding 2 young in a hole in a nearly dead birch at Spence Lake.

YELLOW-BELLIED FLYCATCHER.* Single bird in pine and birch woods on the spine of the esker 5 August.

OLIVE-SIDED FLYCATCHER. Single males singing in the tops of sentinel spruces from 8 July to 2 August at Swan, Boland, Mullins and Tighe Lakes. Immature seen 2 August.

TREE SWALLOW. Seen sporadically through the summer from late May to 17 August at Boland, Mullins and Tighe Lakes.

BARN SWALLOW.* Three flying over the dock 15 June; single bird over the dock 16 July.

Arctic Tern *Wayne Lynch*

GRAY JAY. Common in the area. Newly fledged young seen from 4 June to 23 July. Immature seen from 8 July to 5 August, in groups of up to 6.

COMMON RAVEN. Seen sporadically in groups of 1-7 from 31 May to 17 August at Boland, Huggins and Cairns Lakes. Pair in a nest 16 August at Huggins Lake but no young seen.

BOREAL CHICKADEE. Individuals and pairs seen sporadically at Boland and Salaba lakes. Two immatures 2 August.

RED-BREASTED NUTHATCH.* Single male feeding along the trunk of a black spruce 27 July near Boland Lake.

AMERICAN ROBIN. One at Boland Lake in late May.

HERMIT THRUSH. One singing at Huggins Lake 30 June.

SWAINSON'S THRUSH. Singing males were first heard 1 June. Only nest found at Boland Lake had 4 eggs in a nest of lichens, grass and sphagnum in a Black Spruce 16 June. Eggs had hatched before a second visit 20 June. Immatures seen by 28 July.

RUBY-CROWNED KINGLET. Seen at Boland, Mullins and Fordham lakes in spruce groves. Courtship seen 8 June. Young first seen 1 July. Three broods of 4, 4, and 3-4 seen. Independent immatures present 30 July. Seen to feed on mosquitoes and caddisflies.

WATER PIPIT. One on the shore on Boland Lake 17 June.

WARBLING VIREO.* Single bird heard and seen in dry pine-spruce woods along the esker at Boland Lake 24 June.

TENNESSEE WARBLER. Common at Boland Lake from 12 June to 27 July. Also seen at Mullins Lake. Range of habitats from spruce bogs to birch and alder thickets. Immatures seen 27 July.

YELLOW WARBLER. Seen at Boland and Mullins lakes in shoreline vegetation, whether spruce or birch. Immature seen 5 August. One male heard in antiphonal song with a Magnolia Warbler.

MAGNOLIA WARBLER.* Singing males seen throughout June in pine, spruce and spruce-birch woods around Boland Lake.

YELLOW-RUMPED WARBLER. Common. Seen at all lake areas visited. Eight broods known around Boland Lake, with 1 to 6 immatures seen together. Fledglings seen from 25 June to 2 August (indicating possible second or late nesting). Birds fed on spiders, mayflies, caddisflies, sawfly larvae, geometrid caterpillars and noctuid moths.

BAY-BREASTED WARBLER.* Male singing in a black spruce near camp 4 June.

BLACKPOLL WARBLER. Pair in alder at Spence Lake 19 June.

PALM WARBLER. Seen sporadically from 19 June, when a singing male was seen in a stand of young pine in a burned spruce bog at Spence Lake, until 2 August, when an immature was feeding in spruce at Boland Lake.

NORTHERN WATERTHRUSH. Single singing male in top of black spruce 4 June; apparently killed by Goshawk.

WILSON'S WARBLER.* Single male in a dense willow thicket at Mullins Lake 6 July.

YELLOW-HEADED BLACKBIRD.* Single male with a flock of Red-winged Blackbirds in the marshes along the edge of Boland Lake 13 June. This species has only been reported north to Kazan Lake and the Churchill River previously.[6] [1]

RED-WINGED BLACKBIRD. Seen only on sedge marshes in the shallows on Boland Lake. First seen 12 June, with first nest, containing 5 eggs, found 15 June. Hatching 17 June. Hatching in other nests 14 and 24 July. Birds from last nest flying by 8 August. Fed on mayflies, caddisflies, dragonflies and caterpillars.

RUSTY BLACKBIRD. Pair apparently raised a brood at Boland Lake since they were seen sporadically from 26 June to 6 August, when an immature was seen with them. Single male at Mullins Lake 8 July.

PINE GROSBEAK.* Single male feeding in spruce woods near camp 15 June. Two males and 1 female feeding in open Jack Pine-Black Spruce near Boland on 1 July. Nero did not report them but noted the possibility of their using open woodland in this area of the boreal forest for breeding.[5] The presence of both sexes at this time of year suggest breeding but no nests or immatures were seen.

WHITE-WINGED CROSSBILL.* Mixed flocks of adults and immatures seen 22 June to 23 July several places in the area. Fed in spruce stands on cones, buds and aphid galls.

SAVANNAH SPARROW. Several pairs in the willows along the large marshes at Boland Lake in June and July.

DARK-EYED JUNCO. Seen throughout the summer in most areas, from 4 June to 7 August. The first, weakly flying young were seen 16 June. The numbers of young in broods varied from 1-4, with 2 the most common. Found in spruce or spruce-pine-birch stands, feeding on caddisflies and mayflies.

CHIPPING SPARROW. Seen in a variety of habitats, from single willows in sedge marshes to dense spruce stands, in most of the areas visited. Nest-building and nest-defense seen throughout June but no young were seen until 6 August when 2 broods of 4 each were seen. Fed on mayflies and sawfly larvae.

WHITE-CROWNED SPARROW. Seen at Spence Lake 19 June and Tighe Lake 15 July in pine and open spruce.

WHITE-THROATED SPARROW. Heard at Mullins Lake 6 July and Boland Lake 13 July in pine stands.

LINCOLN'S SPARROW. Pairs seen at Boland Lake 27 June and 1 July in spruce stands.

SWAMP SPARROW. One in alders in a marsh near Boland Lake 8 June.

SONG SPARROW. Seen at several lakes between 19 June and 6 August. Young first seen 8 July. Fed on caddisflies and mayflies.

Species Diversity

Species diversity and abundance in this area can be inferred from the number of birds seen and heard in a 7 km walk along the shore of Spence Lake on 19 June, between 0915 and 1730. The shore was mostly occupied by spruce bog, with some spruce groves and open marsh. The total number of individuals of each species seen during the traverse is given in parentheses.

Common Loon (1); Red-breasted Merganser (1); Bald Eagle (1); Osprey (1); Spruce Grouse (10); Herring Gull (1); Northern Three-Toed Woodpecker (4); Gray Jay (3); Ruby-crowned Kinglet (1); Yellow-rumped Warbler (10); Palm Warbler (1); Blackpoll Warbler (1); Dark-eyed Junco (5); Chipping Sparrow (5); White-crowned Sparrow (1); Song Sparrow (1).

Acknowledgements:

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[3] HOUSTON, C. S. and M. G. STREET. 1959. The birds of the Saskatchewan River: Carlton to Cumberland. Spec. Publ. No. 2, Sask. Nat. Hist. Soc. 205 pp.

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SPRING MIGRATION OF BALD EAGLES NEAR SASKATOON

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An estimated 11,600 Bald Eagles summer along the shores of the lakes and rivers of northern Saskatchewan.[1] Virtually all of these eagles winter in the western half of the United States.[2]

Each spring heralds the return of these eagles from their months in the south. This article discusses the spring Bald Eagle migration in the vicinity of Saskatoon based on our personal observations in 1981, and on data compiled from observations by members of the Saskatoon Natural History Society for the period 1960 to 1975.

Methods

We reviewed 311 Saskatoon area Bald Eagle spring observations made by members of the Saskatoon Natural History Society during the period 1960 through 1975. The earliest spring sighting was 11 March, the latest 6 May. For each sighting, the following information was available in most but not all cases: 1) the maturity of the eagle (adult with white head and tail, or immature), 2) whether the bird was flying or perched and, if flying, the direction of flight, 3) the location of the sighting and 4) the time of day.

Weather records for 1967 through 1975 were obtained from the Monthly Meteorological Summary from the Atmospheric Environment Service, Environment Canada. Since most Bald Eagle migration occurs when the temperature is at or near the daily maximum and since the maximum daily temperature indicates warming and cooling trends, we used maximum daily temperature to assess the influence of temperature on migration following the example of Haugh.[3] Winds from 0900 to 1500 hours were used to assess the influence of wind on the eagle migration, again following the example of Haugh.[3] Winds were assigned a direction using 16 compass points S, SSW, SW, etc. When the wind changed more than 90° during the day it was called a variable wind and was not used in the analysis. Birds were considered migrating if they moved consistently in one direction.

For comparison of available migration weather with weather chosen by eagles to migrate, we used data for the period 20 March to 20 April only for the years 1967 through 1975. Thus the statement that 3.2 eagles/day were seen migrating on SSW winds means that from 20 March to 20 April, an average of 3.2 eagles were seen migrating per day with SSW winds.

Since this 16 year review of spring migration data provided only a random sampling of the eagle migration through the Saskatoon area, we spent 14 days in 1981 (29 March to 11 April) in the vicinity of Saskatoon watching the spring eagle migration and sighted 59 Bald Eagles. Specific notes was kept of roost sites. Whenever possible eagles were followed by car after they left their roost, to document the routes they took and their style of migration. Statistical comparisons were performed using the X^2 test.

Results

a) Timing of the migration

Bald Eagles migrate through the Saskatoon area in March and April with

Table 1. TIMING OF THE SPRING MIGRATION OF BALD EAGLES THROUGH SASKATOON

Dates	*No. Adults (%)*	*No. Immatures (%)*	*Total (%)*
Mar. 7-11	1 (1)	0 (0)	1 (<1)
Mar. 12-16	1 (1)	0 (0)	1 (<1)
Mar. 17-21	3 (2)	1 (2)	4 (1)
Mar. 22-26	24 (13)	3 (5)	27 (9)
Mar. 27-31	35 (18)	3 (5)	45 (14)
April 1-5	39 (20)	6 (9)	64 (21)
April 6-10	53 (28)	16 (25)	85 (27)
April 11-15	34 (18)	23 (35)	63 (20)
April 16-20	2 (1)	3 (5)	9 (3)
April 21-25	0 (0)	7 (11)	7 (2)
april 26-30	0 (0)	1 (2)	1 (<1)
May 1-5	0 (0)	2 (3)	3 (1)
May 6-10	0 (0)	0 (0)	1 (<1)
TOTALS	192	65	311

Table 2. HOURLY TIMING OF THE SPRING MIGRATION

Time of day	*Number of bald eagles seen perched (%)*	*Number of bald eagles seen migrating (%)*
0600-0659 hrs.	10 (16)	8 (5)
0700-0759 hrs.	5 (8)	2 (1)
0800-0859 hrs.	4 (6)	2 (1)
0900-0959 hrs.	1 (2)	0 (0)
1000-1059 hrs.	2 (3)	10 (6)
1100-1159 hrs.	1 (2)	24 (15)
1200-1259 hrs.	2 (3)	37 (24)
1300-1359 hrs.	2 (3)	20 (13)
1400-1459 hrs.	0 (0)	20 (13)
1500-1559 hrs.	0 (0)	17 (11)
1600-1659 hrs.	0 (0)	12 (8)
1700-1759 hrs.	13 (20)	4 (3)
1800-1859 hrs.	19 (30)	0 (0)
1900-1959 hrs.	5 (8)	1 (1)
TOTALS	64	157

Table 4. BALD EAGLE MIGRATION AND THE CHANGE IN THE MAXIMUM DAILY TEMPERATURE OVER THE PREVIOUS 24 HOURS

Change in the maximum daily temperature	*No.of eagles seen migrating*	*No of days (20 March to 20 April '67-75)*
Increase	91	153
Decrease	33	113
No change	1	22

rare sightings in early May (Table 1). The mid-date for adult Bald Eagle observations was 5 April (16% by 29 March, 84% by 12 April). Immatures were generally a little later than adults with the mid-date being 12 April (16% by 3 April, 84% by 18 April). Migratory movement was observed as early as 0630 hours and as late as 1900 hours. However, most migratory Bald Eagles (89%) were seen between 1000 hours and 1700 hours with a peak (24%) from1200 to 1300 hours. Most Bald Eagles seen before 1000 hours and after 1700 hours were perched and not migrating (Table 2). Similarly, in 1981, most eagles began their flights between 1000 and 1100 a.m.

b) The influence of weather on migration

Maximum daily temperatures during days when Bald Eagles were migrating were usually between 0 and 14°C (Table 3). Migration was more likely on days when the maximum temperature had risen above that of the previous day (Table 4). Even though the maximum daily temperatures were usually above freezing, most Bald Eagles (90%) were seen in the Saskatoon area in spring when there was still snow on the ground and 31% were seen at a time when there was 12 cm or more snow.

Winds appeared to influence eagles migration. It occurred mostly on SSW winds (3.2 eagles per day) and frequently on S winds (1.5 eagles per day). While eagles were seen migrating when winds were in almost all directions, all other winds together averaged only 0.27 eagles per day. The difference between S and SSW winds and all other winds is significant (probability less than 0.01). Interestingly, 50 eagles were seen migrating in 46 days during 1967-1975 with SSW, SW and WSW winds while only 1 Bald Eagle was seen migrating in 31 days with SSE, SE and ESE winds.

Table 3. INFLUENCE OF MAXIMUM DAILY TEMPERATURE ON BALD EAGLE MIGRATION

Maximum daily temperature °C	*No. of Bald Eagles seen migrating*
—20 to —16	0
—15 to —11	0
—10 to —6	6
—5 to —1	7
0 to + 4	32
+5 to + 9	40
+10 to +14	36
+15 to +19	11
+20 to +24	1

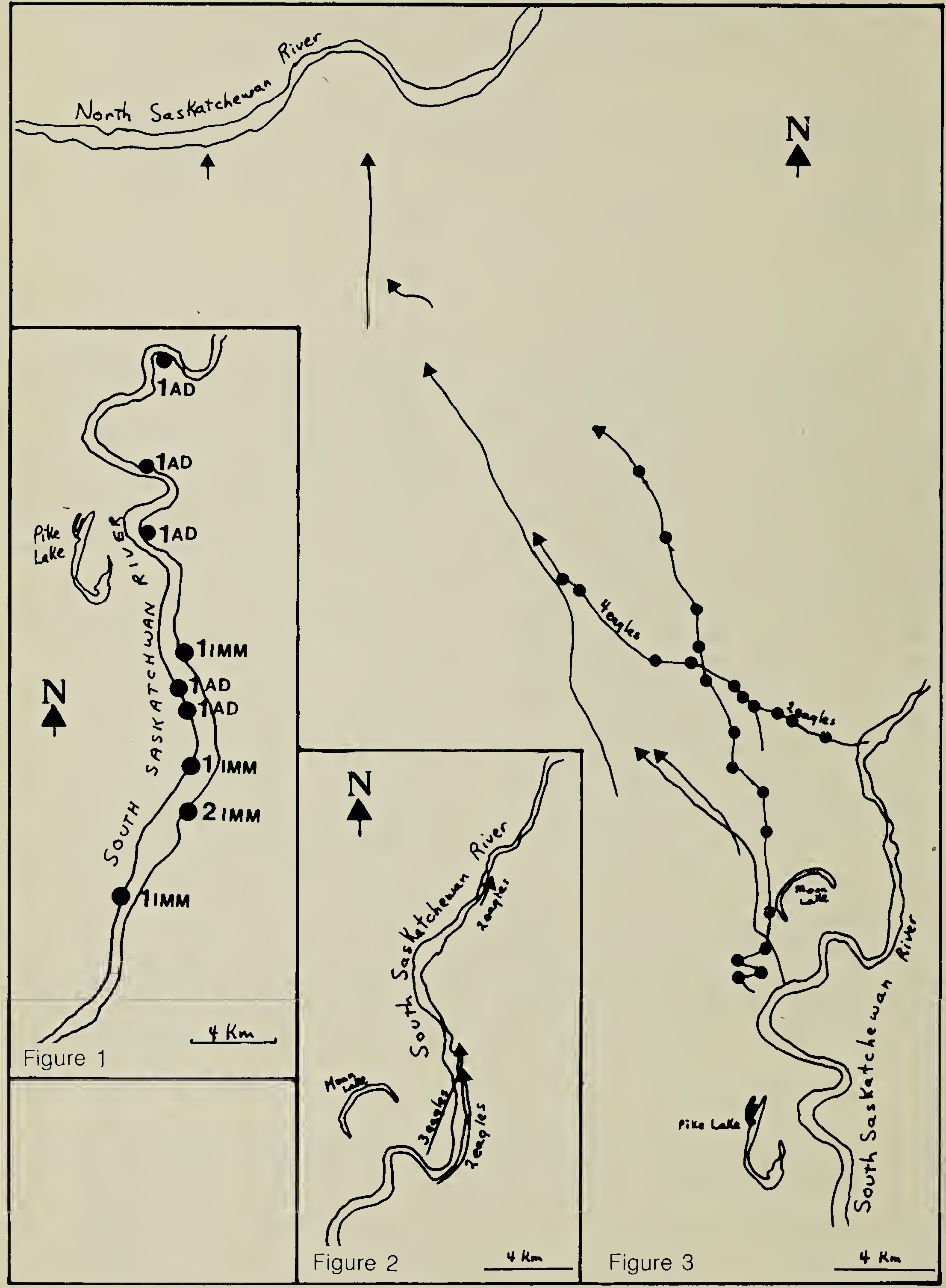

Figure 1

Figure 2

Figure 3

Figure 1. *Locations of eagles perched along the South Saskatchewan River on April 2, 1981. The eagles were mostly singles spaced 1 to several kilometers apart.*

Figure 2. *Eagle movement along the South Saskatchewan River on April 7, 1981. There was a strong west wind and most birds were using updrafts immediately above the river bank.*

Figure 3. *Eagle migration April 4, 5 and 8, 1981. Paths of 11 Bald Eagles are shown. For two routes, the locations of thermals used by the eagles are shown as the solid circles.*

Immature Bald Eagle *Wayne Lynch*

When winds had any westerly component, 46 of 70 Bald Eagles seen migrating were seen on the east side of the Saskatchewan River. In contrast when winds had any easterly component, 25 of 33 Bald Eagles seen migrating were seen on the west side of the river. The difference in this distribution is significant ($p<0.01$).

In 1981 eagles stayed perched along the river all day when the sky was completely overcast and clouds were low. In contrast, when the sun was shining, eagles travelled on any wind.

c) Topography

Topography appears to influence the path chosen by eagles for migration. The South Saskatchewan River is critical for eagles migrating through the Saskatoon area, for almost all roosting sites were within its valley. As an example Figure 1 shows the distribution of eagles perched along the river on 2 April 1981.

While eagles migrated along the river on some days (see Figure 2), on most days they travelled away from the river. Figure 3 shows the paths of 11 eagles on three days in 1981. The routes taken suggest a migration corridor a few miles wide. Within this corridor the land is not quite as flat as farther northeast and there are more trees.

d) The Style of Migration

Bald Eagles used three methods of migrating. The most common was to soar up in a thermal and then glide down to another thermal (Figure 4-A). With south winds eagles sometimes continually circled, moving north as they did so (Figure 4-B). On one day in 1982, when there was a strong west wind, eagles moved north along the east bank of the river gliding continually in updraughts (Figure 4-C). Flapping flight was used rarely, primarily to find the first thermal of the day. Occasionally, if an eagle did not arrive at a thermal at the

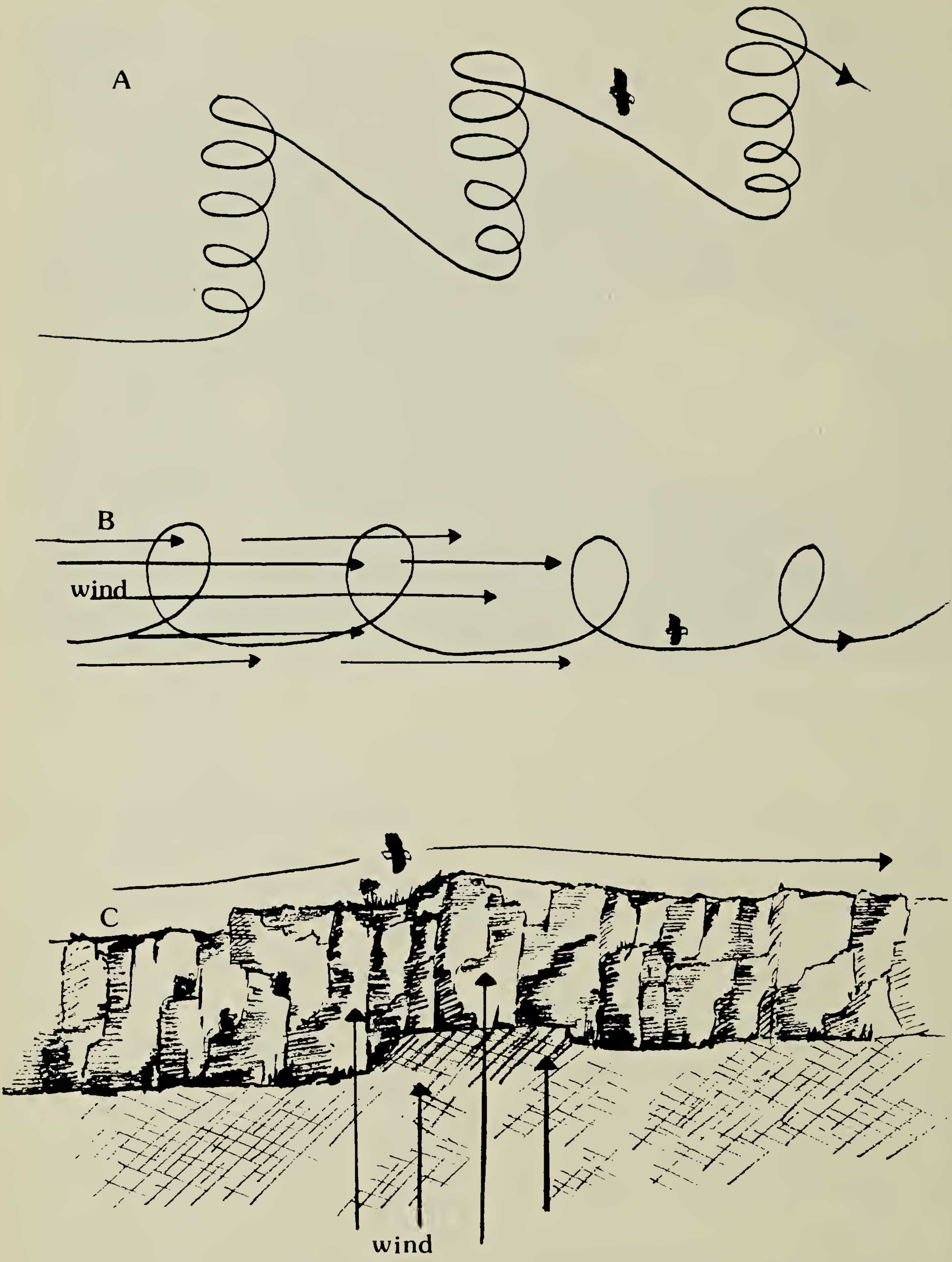

Figure 4. *Patterns of eagle migration. When travelling into the wind, and sometimes when travelling crosswind or downwind, eagles gained height by soaring in a thermal then glided on to the next thermal (A). Sometimes, when travelling with a following wind, eagles were seen circling steadily drifting downwind as they did so (B). On April 7, when travelling along the river, the eagles used updrafts created by the wind heading in toward the river bank (C). Flapping flight was observed rarely, being reserved for use in reaching the first thermal, or occasionally when an eagle reached the bottom of a glide without having found the next thermal.*

end of its glide, it was forced to flap until it found the next thermal. Of two birds timed on different days, the first adveraged 150 seconds climbing (soaring) in each of seven consecutive thermals (range 110-230 seconds), while the other averaged 153 seconds climbing in each of 9 such thermals (range 40-270 seconds). The first bird averaged 196 seconds in each of 7 glides between thermals (range 120-370 seconds) while the second averaged 154 seconds in such glides (range 45-490 seconds). There was a tendency to climb higher and farther as the day progressed and as thermals became stronger. It is possible that these times are only typical of the early thermals between 1000 and 1200 hours.

e) *The Speed of Migration*

One eagle travelling into a light wind covered 29 km in 70 min (25 km/hr). Two others travelling together into a light wind covered 17 km in 38 min (27 km/hr). One eagle travelling with a light following wind covered 12 km in 22 min (33 km/hr).

Discussion

This study expands on earlier observations of raptor migrations through the Saskatoon area in spring.[4] This spring eagle migration coincides with the beginning of mid-day temperatures just above freezing, with considerable snow still on the ground. In accord with observations elsewhere, adults move northward about one week earlier than immatures, presumably because of the need of adults to set up territories and begin incubation. Migration usually starts between 1000 and 1100 hours and occurs on all sunny days when thermals (rising columns of air caused by differential solar heating of the layer of air above the ground) are generated. On overcast days there is no migration, a finding also made in studies of eagles migrating from Colorado to Saskatchewan by Al Harmata (personal communication). Migration was most frequent when the maximum daily temperature rose above that of the previous day, and on days when the winds were from the south and southwest. These results agree with John Haugh's in his study of hawk migration.[3] However, our finding that migration was more frequent on southwest winds than on southeast winds differs from Haugh's observations of the spring hawk migration at Derby Hill at the eastern end of Lake Ontario. The results may reflect a real difference in the choice of winds by Bald Eagles, or more likely, based on experience in 1981, may have reflected the presence of fewer observers on the west side of the river where Bald Eagles may tend to travel on southeast winds.

The South Saskatchewan River valley provides roosting sites for migrating eagles. In spring migration is oriented with respect to these roosting sites. On any easterly wind, eagles appear to leave the South Saskatchewan River valley (which travels from southwest to northeast in the Saskatoon area), and may move away from the river. For their route they chose land which was slightly rolling and with more trees, and avoided where possible completely flat farmland area with few trees. These findings agree with observations of Malmberg in Sweden that birds of prey tend to follow forested areas and avoid cultivated plains.[5] Observations of migrating eagles in 1981 suggested that slight irregularities in terrain were associated with better thermals earlier in the day than completely flat and open farmland.

When winds had a westerly component, Bald Eagles were more likely to migrate on the east side of the South Saskatchewan River. This suggests that Bald Eagles, like other raptors, are subject to some "down-wind drift" from their precise line of migration. The role of west winds in "holding" Bald Eagles along the South Saskatchewan River is emphasized in the migrations seen in 1970 and 1971. In 1970, from 29 March to 10 April there were 13 consecutive days without a wind with an easterly component between 900 and 1600 hours. During this period 36 Bald Eagles were seen in the Saskatoon area. In 1971, from 3 April to 16 April, during another period without wind with an easterly component lasting 14 days, 45 Bald Eagles were seen in the Saskatoon area. No other periods of similar duration without easterly winds occurred during the eagle migration in the years that the weather was carefully evaluated (1967-1975). In all other years, 1967 through 1975, only in 1969 were there as many eagles seen in the Saskatoon area in a comparable period of time (39 Bald Eagles in 10 days).

Acknowledgements

We thank J. B. Gollop for his help in assembling the records of the Bald Eagles seen in the Saskatoon area, many of which were his own sightings. We also thank C. S. Houston for helpful comments on the manuscript.

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Summer Sky *Gary W. Seib*

CLIFF NESTING BALD EAGLES IN NORTHERN SASKATCHEWAN

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Gerard *et al* listed several factors which influence nest site selection of Bald Eagles in Saskatchewan.[7] Bald Eagles were found to prefer shoreline habitat on large lakes and rivers, or sites on islands. The authors also noted that only 2 out of 290 nests were on cliffs, the rest being in trees. Godfrey states that Bald Eagles nest "mostly in trees, frequently near the top; more rarely on cliff ledges".[9] Thus a Bald Eagle occupying a cliff nest is rather an unusual circumstance, and is probably the result of an adaptation due to the lack of trees sturdy enough to support a large nest.[6 15]

This is the situation at Hunt (known locally as Lefty's) Falls, in far northern Saskatchewan, where a pair of Bald Eagles was found nesting on a cliff in August of 1980. The author made these observations while conducting field work for Saskatchewan Environment from 6-13 August 1980, and 12-16 June 1981. The location of the cliff nest was on a lake (dubbed Eagle Rock Lake) above Hunt Falls, on the Grease River, 41 km northwest of Stony Rapids, at 59°30' N 106°25' W.[5]

Hunt Falls lies on the border of the Northwestern Transition and Athabasca South sections of the boreal forest.[13] The area possesses rugged, high-relief terrain and is completely forested with Black Spruce (*Picea mariana*), White Spruce (*Picean glauca*), Alaskan Paper Birch (*Betula neoalaskana*) and Jack Pine (*Pinus banksiana*) on bedrock outcrops; Jack Pine — lichen woodland on sandy till; and various combinations of shrubs, Balsam Poplar (*Populus balsamifera*) and Trembling Aspen (*Populus tremuloides*) in the stream valleys.[5]

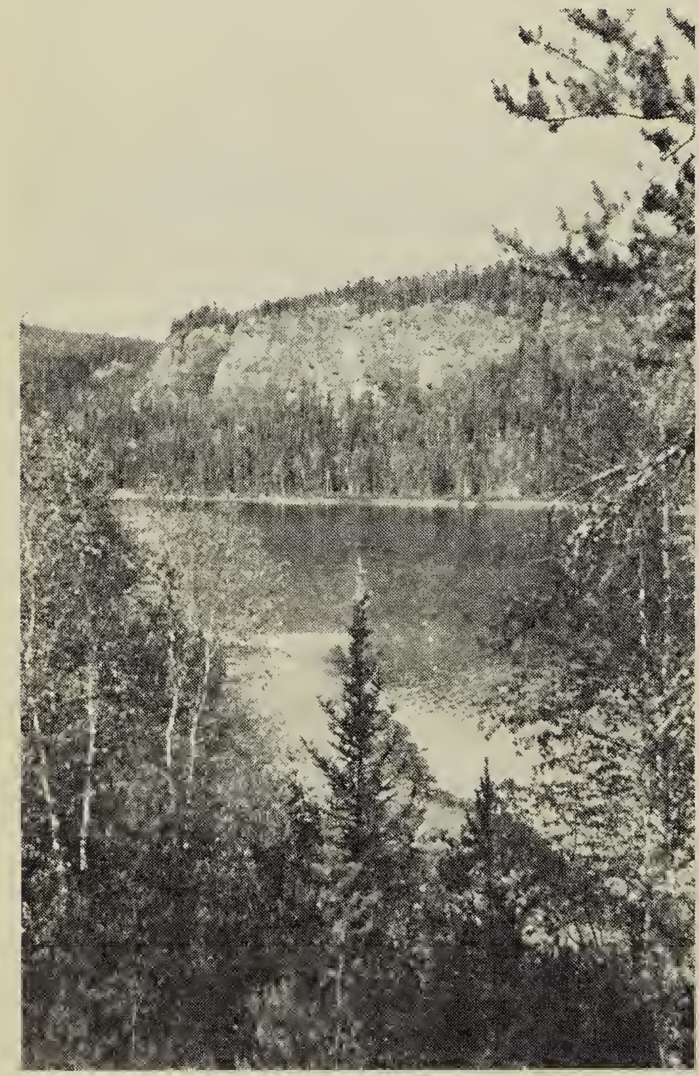
The eagle cliff nest was first observed on 8 August 1980, about three-quarters of the way up a sheer 50 m cliff which rimmed the north side of the lake (Fig. 1). The base of the cliff consisted of piles of large boulders and rubble, with a growth of shrubs and jackpine which extended 15 to 20 m to a narrow sandy beach. A large area of whitewash drew attention to the nest, which consisted of a jumble of sticks resting on the ledge and spilling part way down (Fig. 2). The nest contained two fully feathered young. For a short while on 9 August both adults were at the nest and both young were fully visible. The adults then flew to a ledge about 30 m to the west, and later to the tops of spruce trees which lined the top of the cliff. The adults were in attendance at or within 0.5 km of the nest until about 1800 hours when viewing ceased. The young were observed on subsequent days in nearly the same positions, one on the outside edge of the nest facing in, and the other lying down in the back facing to the right (east). On the morning of 10 August the first young eagle moved from its outside position to a point on the ledge just below the nest. It moved back up a short time later, then returned to the ledge.

The nesting cliff, accessible only by canoe, was visited 11 August. A walk to the top of a nearby section of the cliff gave an indication of what the eagles would be seeing from the ledge: a view of the steep and rugged terrain stretching off in the distance, and the lake below. One adult eagle was flushed from another part of the cliff. Forest fire smoke made it impossible to obtain clear photographs. On 12 August both young were sitting up, and both adults were on the tops of nearby spruce trees.

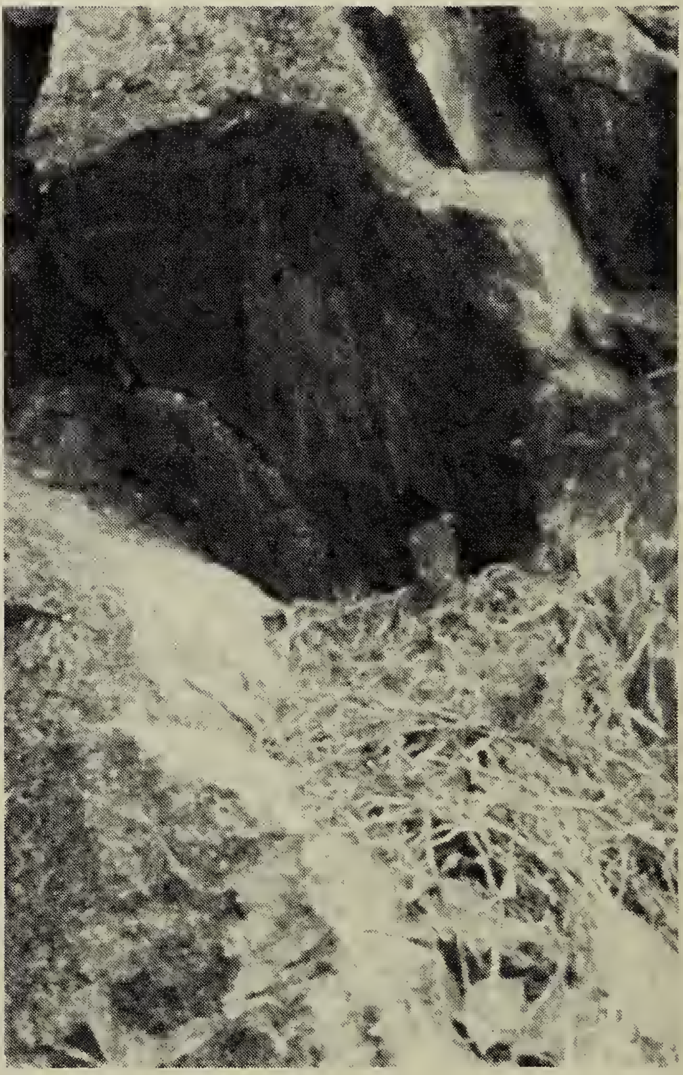
The area was revisted 12-16 June 1981, but the cliff nest was deserted. A single adult Bald Eagle was seen on a large tree on top of a cliff (smaller than the one previously described) at the confluence of the Grease and Straight Rivers, about 3.5 km SSW from the nest described above. The cliffs in this area form part of the Grease River-Straight River fault line. There was no evidence of any eagles nesting in the area, but no time was available to confirm this. There was a stick nest in a large aspen on the opposite bank at the confluence, and a Common Raven was flushed from the site.

A search of the literature and of the Prairie Nest Records Scheme (PNRS)[3] revealed a number of references to Bald Eagle cliff nests in Saskatchewan. (No references were found for the adjoining provinces.) These were as follows:

> Grove Lake (Porcupine River), near Stony Rapids, 59°20' N 104°10' W (G. Anweiler and M. R. Lein).[3 4 12] 15 July 1964. The nest, active but inaccessible, was situated on a ledge 75 feet up on a cliff along the river. The contents were not determined.
>
> Fond du Lac River, 7 miles west of Stony Rapids (B. Siemans). 24 July 1962. A nest with one young was observed "on top of a rock cliff 100 feet above the river".[11]
>
> Lower Foster Lake, 56°20' N 105°20' W (D. Whitfield, J. Gerrard).[3 6] 14 July 1968.



Cliffs at Hunt Falls *Chris Adam*



Bald Eagle nest *Chris Adam*

Cliff, no other details given. One young was in the nest. It was empty when revisited on 18 July 1969.[6]

Foster River, 56°20' N 105°30' W (D. Whitfield, J. Gerrard).[3 6] 18 July 1969. Cliff, no other details given. Three young were in the nest. Gerrard also comments that in 1940 a forest fire swept the Foster Lakes area, resulting in a lack of suitable nest trees.[6]

"A small river 8¼ miles ENE of Otter Rapids (55°40' N 104°30' W), reported by Dr. Johnson of Prince Albert".[4] The nest was observed "in early July, 1965, on the face of a cliff about 30 feet above the water". It apparently was "recently occupied". Whitfield and Gerrard visited it on 1 July 1966, but it was not occupied at that time.[4] Gerrard states that this cliff nest was revisited in 1968 and was found to be used by Golden Eagles.[6] He suspects that this nest had been used by Golden Eagles all along.

Clearwater River, one mile from the Black Birch River mouth (G. Nelson).[4] This nest was used for several years by a pair of eagles which nested on the ledge of a cliff. In view of the comments by J. Gerrard above, this record must remain unsubstantiated.

Fond du Lac River, 12 miles west of Stony Rapids (J. Good).[4] "At first the nest was in a dead jack pine snag, but eventually the snag fell down and they nested for a couple of years on a ledge of rock in the same area". This was in the early 1960's, and seems to be a sound record.

Flight out of Creighton, July, 1967.[8] Two cliff nests were observed (location not given) but were empty at the time of the flight. These nests had been active for several years previous to 1967; one observer had seen a parent with a dark head and tail. Gerrard reported that although on rare occasions an immature Bald Eagle can raise young at nests, this only occurs in stressed populations where there is a paucity of adults.[6] This nest, and the other one seen, probably belong to the Golden Eagle.

Two references to nests in the Northwest Territories are also described.

7 miles SW of Fort Reliance, 62°30' N 109°10' W (E. Kuyt).[3] 23 July 1968. The habitat was a rock escarpment in the boreal forest, and the nest, containing one young, was on a ledge 70 feet up a cliff.

A record of ground-nesting Bald Eagles on the West Mirage Islands, 62°16' N 114°29' W, on Great Slave Lake, 21 km SSW of Yellowknife, is described in a short note by Bromley and Trauger.[2] The authors describe a ground nest on a small island "on a low rocky peninsula only a few feet above water" and situated about 55 m from a small grove of trees. This ground nest was first noted in July of 1970 but did not contain young until July 1972. The ground nest again contained young the following year. The authors pointed out that during 1970 and 1971, the eagles, presumably the same ones which had built the ground nest, were nesting near the top of a dead 9 m spruce tree on an adjacent island, 275 m from the ground nest. This tree nest was in a precarious position, and had to be rebuilt each year, after being blown down. Bromley and Trauger considered that this contributed to the construction and later use of the ground nest, an obviously more secure site. It is interesting to note that in 1972, the eagles raised young in the ground nest after having rebuilt the tree nest.

Bent (p. 335) cited other instances of Bald Eagles nesting on cliffs and buttes on coastal areas and along rivers in the Alaskan Peninsula and in northern Canada.[1] Bent concluded that eagles will nest in these situations in the absence of trees. Troyer and Hensel reported on a Bald Eagle nesting survey on Kodiak National Wildlife Refuge in Alaska.[16] They found that although eagles preferred to nest in Black Cottonwood (*Populus trichocarpa*) trees, and since these were not present in great quantities, other substrates used were rocky cliffs and the "bases of alder [*Alnus crispa*] trees protruding from rock cliffs along the seashore". The authors noted that eagles did not nest in areas where no trees or cliffs were present. In 1963, out of 158 active nests, 106 were in cottonwood trees, 35 on rocky cliffs, and 17 on alder cliffs.

Sherrod *et al*, in their study of Bald Eagles on the treeless Amchitka Island of the Aleutian Island chain, Alaska, reported that eagles will normally nest on sea stacks (pinnacles sticking out of the sea), ridges, islets and hillsides.[15]

Bent and Harrison note that Bald Eagles will usually use the same site for several years, adding to the nest each year until it becomes very large.[1] [10] This may not be possible on narrow cliff ledges, such as the situation of Hunt Falls. This is demonstrated by the Amchitka study, where nest size was determined by the substrate used, and the nest material was usually destroyed every year by weather, resulting in yearly rebuilding or remodeling.[15]

In Saskatchewan, cliffs are common in the northwest corner of the province, including the Uranium City and Beaverlodge Lake area, but decrease in number eastwards to Black Lake and Stony Rapids. East of this their occurrence is sporadic. Regions with cliffs are thus present on the north side of the Athabasca basin, with some scattered across the remainder of the Precambrian Shield, notably in the Deep Bay — Reindeer River area.[14]

Bald Eagles, then, will nest on cliffs, buttes and ground sites where there are normally no trees, or where the trees are too small. In forested Saskatchewan and adjacent areas the use of cliffs is a rather uncommon adaptation of a normally tree-nesting species.

Acknowledgements

I would like to thank H. T. Epp and J. Gerrard for reviewing the manuscript.

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THE NORTHERN PARULA IN MANITOBA

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The northwestern limit of the breeding range of the Northern Parula has never been well defined. The latest check-list of the American Ornithologists' Union puts it at southeastern Manitoba (Winnipeg), but the only records for that city are of migrants (see below).[1] Early records indicating breeding at Waugh, Caddy Lake and McArthur Falls are not quite conclusive, as no nests or recently fledged young were found. These early records account for statements by Sprunt that the Northern Parula breeds in southeastern Manitoba, by Godfrey and by Salt and Salt that it breeds locally at Waugh, and by Bent that it breeds north to Shoal Lake (near Waugh) and Caddy Lake.[62] [15] [56] [5] The recent discovery of at least one nest in Manitoba confirms this species' breeding status in the province.

In this paper, we review the occurrence of this attractive warbler in Manitoba, with notes on surrounding states and provinces. Recent evidence of breeding in Manitoba is presented. This article is a combination of two manuscripts written independently by the two authors and combined by McNicholl. Earlier records were compiled primarily by McNicholl, and recent material mainly by Taylor.

Status in Surrounding States and Provinces

Godfrey indicated that the breeding range of the Northern Parula (Parula Warbler) includes the more southerly parts of northwestern Ontario, although he only cites breeding localities in the central and southern portions of that province.[15] A recent annotated check-list of Ontario birds refers to it as an "uncommon local resident" across Ontario north (and west) to Kenora.[30] The late A. E. Allin regarded it as rare at the Lakehead (Thunder Bay), but had several migration records there, notably several observed during an unusually heavy flight of warblers in May 1954.[43] [44] [45] [46] [47] Taylor found this species to be fairly common in some mature mixed-wood stands in Sibley Provincial Park, east of Thunder Bay, in early July of 1977 and 1979 (unpublished observations).

The Parula is a regular migrant and summer resident in Minnesota, but breeding has not yet been confirmed for the northwestern part of the state, adjacent to Manitoba.[19] Stewart did not include the Northern Parula in his recent book on breeding birds of North Dakota, but in an earlier checklist he classed it as a "current" species, i.e., having occurred at least three times in at least two seasons since 1920.[64] [63] Recent records in North Dakota include spring sightings at Jamestown in 1963, Fargo in 1968, La Moure in 1972, and Grand Forks in 1980, and a fall record in Fargo in 1975.[52] [21] [29] [60] [58]

Sealy summarized Alberta and Saskatchewan records to 1970.[57] He did not include an unconfirmed record from Sovereign, Saskatchewan in 1930 and Tremaine's vague reference to seeing the species in Saskatchewan in 1965.[53] [6] [65] Callin also mentioned a 1935 record at McLean, Saskatchewan.[6] Tremaine's record was of a singing male watched for about 10 minutes at the Flotten Lake campground on 6 July

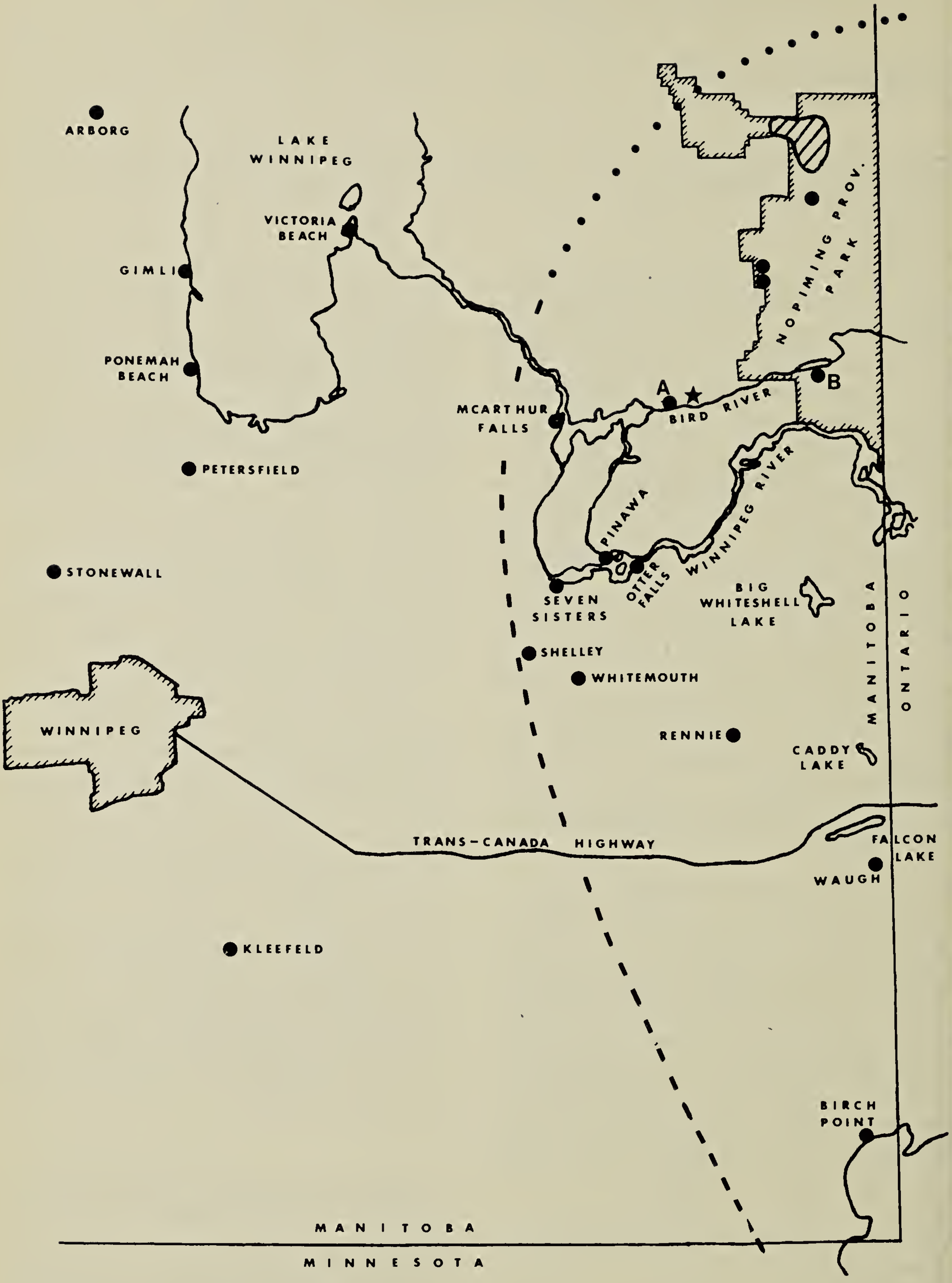

Figure 1. *Map of southeastern Manitoba, showing most localities mentioned in the text (Brandon, Ninette, St. Ambroise and the International Peace Gardens are farther west). The known breeding range of the Northern Parula lies south and east of the broken line. The area north of the dotted portion is poorly known ornithologically, and the breeding range may well extend farther in this direction.*

1965 (pers. comm. to McNicholl, 14 December 1968). Although unconfirmed, this record should be considered probable in view of Dr. Tremaine's previous experience with the species and the length of observation time. Saskatchewan records since 1970 include two in Saskatoon May 1972, two males in Regina May 1979, and a singing male near Ekapo Lake May 1979.[2 29 61 16 4 6] Sealy cited only one Alberta record, and Houston referred to a Calgary record in spring 1971 as Alberta's second.[57 28] However, Salt mentioned unpublished records for Wayne and Rosedale in 1958, and an August record in Calgary prior to 1971 (year not stated by Salt or his source).[55] Sadler and Myres dismissed the earlier Calgary record as undocumented.[54]

Manitoba Records Prior to 1975

Data on records of the Northern Parula in Manitoba prior to 1975 are summarized in Table 1 and most locations are plotted on Figure 1.

Table 1. MANITOBA RECORDS OF THE NORTHERN PARULA PRIOR TO 1975

Date	*Locality*	*No.*	*Sex*	*Observer(s)*	*Reference*
*Sept. 1917	Winnipeg	1	m	J. J. Golden	20, 32
*2 or 3 July 1923	Indian Bay, Shoal Lake (Waugh)	6-8	both	C. R. Broley C. G. Harrold E. Kiteley	20, 32
? 1923	Ponemah Beach	?	?	"A. & K. McL."	31
7 May 1924	Ninette	3	?	W. C. Scott	33
13 May 1926	Ninette	?	?	R. C. Scott	34
24 May 1929	Victoria Beach	?	?	E. Keighly	36
24 May 1929	Caddy Lake	2(+?)	m	B. W. Cartwright	7, 41
19 May 1930	Winnipeg	?	?	H. Hatton	37
20 May 1931	Whitemouth	?	?	V. Latta	38
17 Sept. 1933	Whitemouth	1	?	V. Latta	39
18 May 1938	Winnipeg	1	f	R. Sutton	40
16-17 June 1945	McArthur Falls	2	m	W. Johnston, G. Smith	41
21 May 1946	McArthur Falls	1	m	W. Johnston	41
24 May to end July 1947	McArthur Falls	2 1	m f	W. Johnston and father	41
? 1948	Petersfield	1	f	S. Wick	42
5 June 1951	Rennie	1	m	W. E. Godfrey	14
1 July 1959	Falcon Lake	1	m	H. Mossop	48
23 May 1961	Winnipeg	1	?	F. J. Coutts	49
9 June 1963	Arborg	1	m	M. K. McNicholl	50
9 May 1964	Winnipeg	1	?	F. J. Coutts	51

*Specimen record.

Several of these are migration reports, lacking additional data and thus without corroboration. Records with additional published or unpublished information are discussed below.

Harrold stated that the first Manitoba record was of an immature bird "taken in Winnipeg" and in September 1917 by J. J. Golden.[20] Golden did not collect the bird in the usual sense, but it was brought to him for identification after being found fluttering against a store window.[32]

The next evidence of the species in Manitoba is a vague message by Lawrence in 1923 to "A. and K. McL." of Ponemah Beach, stating that the Parula Warbler is only accidental in Manitoba; this was probably in response to a report which he doubted.[31] In July of the same year, C. R. Broley, C. G. Harrold and E. Kitely penetrated a dense tamarack swamp, festooned with *Usnea* lichen, near the shores of Indian Bay on Shoal Lake near Waugh, and found what appeared to be a breeding group.[20 32] Although Lawrence later credited Harrold with discovering the first nest of the species in the province, both Harrold and Lawrence himself stated that no nest was actually found; Lawrence evidently based his former statement on the presence of six to eight individuals during the breeding season.[35 20 41 32] Harrold recorded the date of the visit as 3 July, Lawrence as 2 July.[20 32] Specimens of two male Parulas in the Manitoba Museum of Man and Nature, Winnipeg, were taken at Waugh by Harrold, presumably on this occasion (Specimen Nos. 758, 759).

There were three migration records in the 1920's, at Ninette and Victoria Beach (Table 1). On 25 May 1929 B. W. Cartwright found a "small colony" of Northern Parulas at Cross Lake, on the portage between Caddy and West Hawk lakes, barely on the Manitoba side of the Ontario - Manitoba border.[7] According to Lawrence, Cartwright's observations consisted of two males "fighting and singing in lively fashion", behaviour which suggests that they were contesting territories.[41]

No additional evidence of nesting was obtained in the 1930's, but Vic Latta, the veteran nest-finder from Shelley, saw the species twice in migration near Whitemouth, and there were two migration records from Winnipeg (Table 1).

In the 1940's, two of Manitoba's most active birders obtained evidence that Parulas probably nested near McArthur Falls. Gordon Smith and Warren Johnston found two singing males there in 1945. Johnston observed males again 21 May 1946 and 24 May 1947, and heard one or two males singing nearly every weekend in June and July in the latter year. He observed that they seemed partial to areas of tall spruce. On 8 June 1947, Johnston and his father observed a female carrying nesting material (Ref. 41 and unpublished field notes). The only migration report in the 1940's was a female in spring of Petersfield (Table 1).

In the 1950's and 1960's, the Northern Parula was seldom reported in Manitoba, but singing males were noted near Rennie in 1951, Falcon Lake in 1959, and Arborg in 1963. Winnipeg's cautious expert, Fred J. Coutts, observed spring migrants there in 1961 and 1964 (see Table 1 for sources). Mossop's observations were more significant than indicated by his passing reference to one singing in the background while he was watching a Winter Wren.[48] When McNicholl reported his observation at Arborg in 1963 to Mossop, the latter indicated that he saw them regularly at Falcon Lake, near the Ontario - Manitoba border. Mossop subsequently indicated in several conversations with McNicholl that Parulas nest at Falcon Lake.

Manitoba Records, 1975-1981

No records of Northern Parulas in Manitoba appear to have been published between 1965 and 1974 inclusive. Hatch noted that one seen in Winnipeg by Mr. and Mrs. Angus H. Shortt 11 October 1975 was "the first record in this decade and probably much longer."[22 23] Since 1975 three areas have been identified in which substantial summer populations occur. Some of these observations have been mentioned briefly in Gardner's and Hatch's newspaper columns and in seasonal regional bird reports, but most of the details are reported for the first time here. In addition, a number of records of migrants, and possibly isolated instances of breeding, have been made and are summarized in Table 2.

Numerous summer observations have been made in mature mixed-wood forest adjoining Manitoba Provincial Road (PR) 315 near the Bird River, between Bird River campground and Bird Lake (Points A and B in Figure 1). The major canopy trees within Parula territories are Trembling Aspen, Balsam Poplar, White Birch, White Spruce and Balsam Fir. *Usnea* lichen occurs, sometimes in profusion, on dead or damaged conifers. Beaked Hazelnut and Mountain Maple are prominent understory shrubs. Typical habitat, including a nest tree, is shown in Figure 2. Between late May and early July each year from 1976 to 1981, Parulas have been observed here by Taylor and other experienced observers (C. W. Cuthbert, D. Fast, D. R. M. Hatch, G. Holland, R. W. Knapton, R. F. Koes, W. Neily, A. H. Shortt and I. Ward), as described earlier by Hatch.[23] The majority of these observations were of singing males, but females have also been seen regularly, and comprise about 15% of all records. A brief mention by Gardner of a Winnipeg sighting by Neily 2 June 1979 is referable to this area.

Table 2. RECORDS OF THE NORTHERN PARULA IN MANITOBA OUTSIDE THE THREE MAJOR KNOWN BREEDING LOCALITIES, 1975 - 1981

Date	*Locality*	*No.*	*Sex*	*Observer(s)*	*Reference*
11 Oct. 1975	St. Vital, Winnipeg	1	m	A. H. Shortt B. Shortt	22, 23
23 May 1976	2 km W of Pinawa	1	m	P.Taylor	59
24 May 1976	St. Ambroise	1	m	G. Grieef G. Holland	3, 9, 59 and pers. comm.
23 June 1976	2 km W of Pinawa	1	m	P. Taylor	Unpubl. obs.
15 May 1977	Gimli	1	m	R. W. Knapton R. F. Koes	10, 24 and pers. comm.
15 May 1977	1 km N of Pinawa	1	m	P. Taylor	Unpubl. obs.
23 May 1977	1 km N of Pinawa	1	m	R. W. Knapton P. Taylor	Unpubl. obs.
26 June 1977	2 and 4 km NE of Pinawa	2	m	P. Taylor	Unpubl. obs.
10-13 Sept. 1977	Stonewall	1	m	K. Gardner	11

Table 2 (continued)

Date	*Locality*	*No.*	*Sex*	*Observer(s)*	*Reference*
20 Sept. 1977	Assiniboine Park, Winnipeg	1	m	G. Panting	11, 24
18 and 20 May 1978	Near Seine River, Winnipeg	1	m	J. Loch	26 and pers. comm.
30 Aug. 1978	Big Whiteshell Lake	1	m	R. W. Knapton	Pers. comm.
26 May 1979	2 km W. of Pinawa	1	m	P. Taylor	Unpubl. obs.
2 June 1979	3 km NW of Pinawa	1	m	G. Grieef P. Horch I. Ward	Pers. comm.
25 Aug. 1979	14 km W of Pinawa	1	f or imm m	P. Taylor	Unpubl. obs.
9 Sept. 1979	2 km NW of Seven Sisters	1	f or imm m	P. Taylor	Unpubl. obs.
12 May 1980	Wellington Cres. Winnipeg	1	m	R. F. Koes	12, 13, 18 and pers. comm. (cited in ref. 27 as 14 May)
13 May 1980	Brandon	1	f	B. Robinson	25
8 June 1980	16 km W of Big Whiteshell Lake	1	m	G. Grieef	Pers. comm.
24 Aug. 1980	Otter Falls	1	f or imm m	P. Taylor	Unpubl. obs.
16 May 1981	Kleefeld	1	m	D. Fast	Pers. comm.
16 May - 21 June 1981	Otter Falls	up to 3	m	P. Taylor et al	See text
13 June 1981	Big Whiteshell Lake	1	m	G. Grieef	Pers. comm.
26 June 1981	International Peace Gardens	3?	m	D. Dupre et al	Neily, pers. comm.
27 June 1981	International Peace Gardens	1	m	W. Neily J. Zoch	Neily, pers. comm.
1 July 1981	22 km NE of Pinawa, beside PR 313	1	m	P.Taylor L. Summers J. Sunder	Unpubl. obs.
16 Aug. - 16 Sept. 1981	Assiniboine Park, Winnipeg	1+ (several sightings)	m	G. Grieef D. R. M. Hatch G. Holland R. F. Koes A. H. Shortt	Grieef, Hatch, Holland, Koes, pers. comm.

The Bird River Breeding Bird Survey consists of 50 three-minute observation stops at 0.5 mile (0.8 km) intervals, east along PR 315 from the Bird River campground. Survey totals of Parulas between 1977 and 1981 range from five (8 June 1977, Cuthbert) to fourteen (17 June 1978, Taylor), with an average of 9 singing males.

A more intensive survey 19 June 1977 revealed 14 singing males between points 1 km west and 5 km east of the Bird River campground. If all singing males within 250 m of the road were located, and each of these represented a breeding pair, this indicates a local breeding density of about five pairs per square kilometre, corresponding to the status "common" (locally), as used by Belcher.[4] The Parula was the second most numerous of ten warbler species recorded in this area on that day.

During the summer of 1977, Cuthbert (pers. comm.) carried out a preliminary survey of breeding bird populations within Nopiming Provincial Park. He found Northern Parulas at 14 locations within an area of about 30 square kilometres near the north end of the park (shaded area in Figure 1). Pairs of birds were noted at three of these sites, and Cuthbert also found single birds at three additional localities within the park (unlabelled points in Figure 1), as well as near the Bird River. These records occurred over the period 12 May to 29 July 1977, principally in mature mixed-wood forest.

On 9 July 1977 Knapton, Koes and Taylor recorded at least 4 male and 2 female Parulas in a White Cedar - Tamarack swamp and adjoining mixed-wood forest and willows, at Birch Point, Lake of the Woods, in the southeastern extremity of Manitoba. Knapton and Koes briefly observed an immature bird begging for food in the willows, giving strong evidence that breeding had occurred in the vicinity. Koes and Taylor estimated 7 singing males to be present at the same location 24 June 1978, and P. Horch and W. Neily reported single birds 28 June 1979 and 13 June 1981, respectively (pers. comm.). R. S. Ferguson carried out an ornithological survey in extreme southeastern Manitoba from 25 May to 7 July 1978, on behalf of the National Museum of Natural Sciences.[8] He found Parulas to be "locally distributed in dense coniferous and mixed forests with a high proportion of Black Spruce, Tamarack, Eastern White Cedar or Balsam Fir." He noted singing birds on five dates between 26 May and 28 June at Birch Point and the nearby localities of Sprague Lake, Mud Lake and Angle Inlet.

Taylor has found singing male Parulas in the Pinawa - Otter Falls area on several occasions in late May and June (Table 2). In particular, up to 3 birds were observed within 1 km of PR 307, south of Otter Falls between 16 May and 21 June 1981. These were again in mature mixed-wood stands with ample *Usnea* on some conifers. These sightings were confirmed by several other experienced observers: A. Blewett, N. J. Cleveland, Fast, Hatch and Lane.

An especially interesting record of the Northern Parula occurred recently at the International Peace Gardens, on the North Dakota - Manitoba border in southwestern Manitoba. Here, Delos Dupre and several other visitors to the province, who were participating in a field trip organized by the North American Bluebird Conference in Brandon, reported 3 singing birds 26 June 1981. Two Manitoba birders, Neily and J. Zoch, confirmed this report in part when they found a single singing male the following day.

Evidence of Breeding

Irregular early reports and regular recent observations of singing male Parulas in appropriate breeding habitat from late May to July, together with a smaller number of sightings of the less conspicuous females, provide strong evidence in support of Lawrence's suggestion that this bird is a locally common breeding species in southeastern Manitoba.[41]

The Parula is noted for its strong affinity for arboreal mosses and lichens.[5 62] Lichens of the genus *Usnea* are used for nesting in the northern part of the breeding range, and are commonly reported at sites of suspected breeding in Manitoba, as noted above. This lichen was common in the vicinity of the singing male seen at Arborg by McNicholl.

The best early evidence of breeding is Johnston's observation of a female carrying nesting material near McArthur Falls in 1947. On 22 May 1978 Holland, Ward and Taylor visited the Bird River area. Ward saw a female Parula enter a clump of *Usnea* about 10 m up in a white spruce. All three observers saw the bird emerge about a minute later; she was evidently at least prospecting for nest sites, and may well have been building a nest. However, no activity was observed at this site during two subsequent visits in June, so breeding could not be confirmed. The same observers and P. Press made similar observations at a location about 25 km farther east, at the junction of PR 315 and Bird Lake Block Road number 10 on 8 June 1980.

An active nest was finally located by Taylor 7 July 1979 in a clump of *Usnea* about 8 m up in a storm-damaged white spruce, very close to the suspected nest-site of 1978 (Figures 2 and 3). During about 45 minutes of observation in the early morning, the female visited the nest with food five times, indicating that young were present. She also settled on the nest to brood briefly during this period. On one occasion she foraged in the understory nearby after feeding the young, but she usually departed into the canopy following visits to the nest. This is the nest cited as "northeast of Lac du Bonnet" by Gollop.[17]

Although there is only this one definitive nest record for Manitoba, the many observations detailed above all

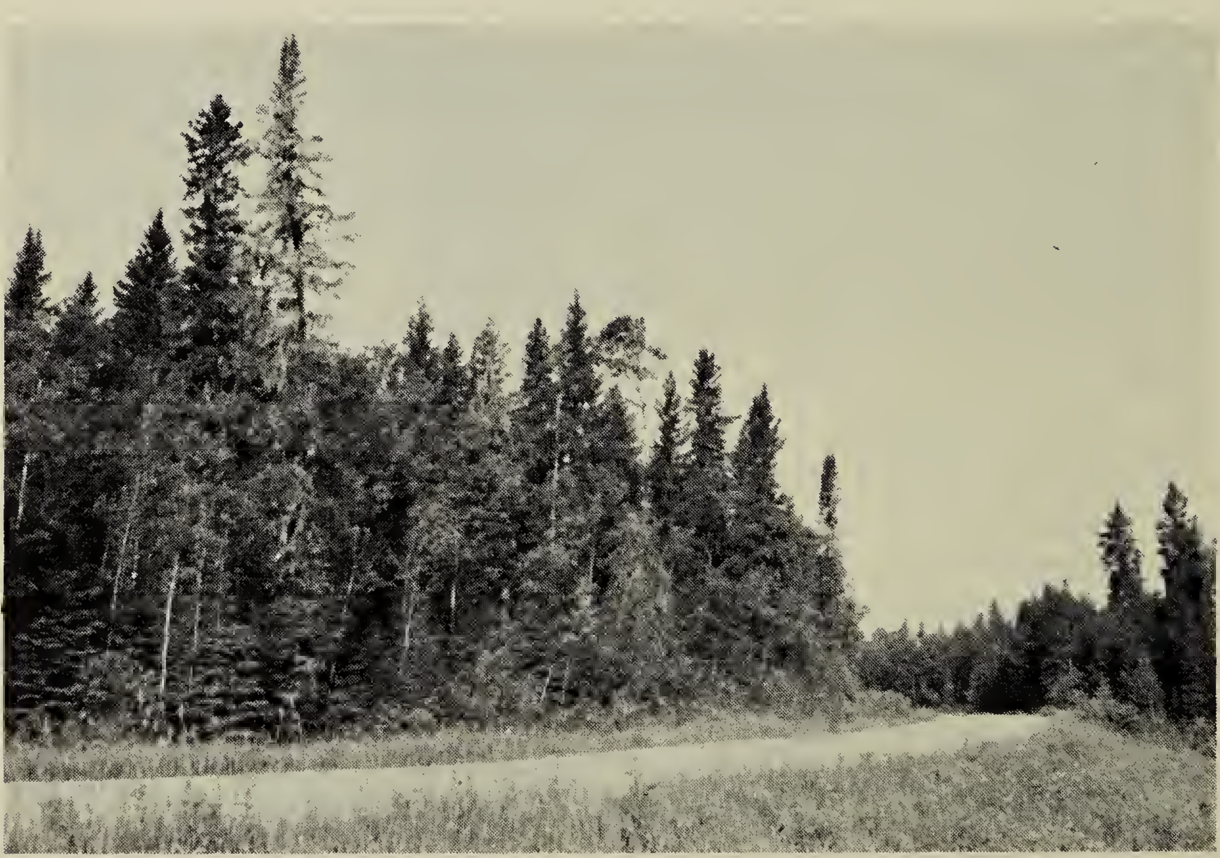

Figure 2. *Location of the 1979 Parula nest alongside PR 315. This mature mixed-wood stand is typical of Parula breeding habitat in this area.*

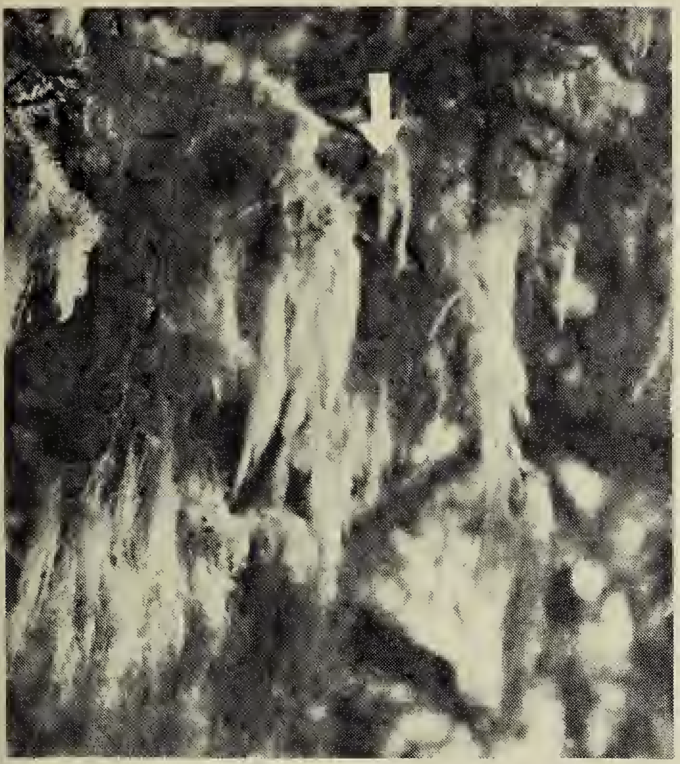

Figure 3. Usnea *lichen festoons a battered white spruce. The right-hand clump has been fashioned into a nest; the tail of the female Parula (arrowed) is just visible as she feeds young.*

strongly indicate that this warbler is a regular and locally common breeding bird within the range delineated in Figure 1. The singing males at Arborg and the International Peace Gardens, and those in Saskatchewan, may have been away from breeding grounds, but the breeding range may well be more extensive than we show. In particular, the southern portion of the Canadian Shield in the Interlake region of Manitoba is poorly known ornithologically and deserves further investigation. A Natural History Society of Manitoba (now Manitoba Naturalists Society) outing to Beaver Creek and Calder's Dock on the western shore of Lake Winnipeg 15 June 1969 was said to have been stimulated partly by rumours of Parulas (H. V. Hosford, pers. comm. to McNicholl during the field trip), and large amounts of *Usnea* were seen at several sites.

Observations on Song

The buzzy songs of the male Parula are distinctive, and are a valuable aid in locating the species during the breeding season.[5] [15] A buzzy ascending trill and an ascending series of buzzy notes are the two song forms most commonly heard. A third song, consisting of a rather flat, soft series of one long and two or three short buzzes, has been heard less frequently. On 2 June 1979 Koes, Neily and Taylor heard an unfamiliar song uttered by a male Northern Parula near Bird Lake. This was a rather high-pitched, *descending* trill, less buzzy in quality than any of the three typical songs. This was repeated several times per minute during about five minutes of observation, and no other songs were uttered during this time; it was unlike any song described by Bent.[5]

Song perches are usually at or near the top of either deciduous or coniferous trees, and are sometimes quite open. The top of the nest tree was one song perch used by the male associated with the nest described above.

Acknowledgements

We are grateful to Mary M. Tremaine for details of her observation, and to all those observers listed in the text and Table 2 who reported observations to Taylor or took part in field trips with him. Herbert W. R. Copland was helpful in obtaining copies of some of Lawrence's columns, and especially in helping McNicholl to track down one record; he also kindly gave Taylor access to records and specimens in the Manitoba Museum of Man and Nature, Winnipeg. Calvin W. Cuthbert and Robert S. Ferguson kindly supplied Taylor with copies of their survey reports. Taylor is grateful to Richard W. Knapton and Brian N. Turner for helpful comments on his earlier manuscript.

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THE IMPORTANCE OF TROPICAL WINTERING AREAS TO PRAIRIE BIRD POPULATIONS

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Prairie naturalists are well aware that many of our birds are with us for only a small part of the year. Many spend more time in tropical wintering areas than on their breeding grounds. One family which demonstrates this particularly well is the Parulidae or Wood Warblers. In Manitoba, most warblers arrive towards the end of May, and are gone by the beginning of September. Allowing three weeks in each direction for migration, around seven months of the year will be spent on the wintering grounds. Hence the conditions of habitat on the wintering grounds can be of vital importance to a bird population. Maintaining the population of any species depends not only on survival in the breeding range, and breeding success, but also on successful migration and wintering.

The three tropical areas where prairie landbirds winter are South America, Mexico and Central America, and the West Indies. Table 1 shows where our warblers spend the winter. Some, such as the Black-and-white Warbler, are widely distributed. Thirteen species travel as far as South America, four of these wintering there and essentially nowhere else.

The Parulidae may be looked on as an essentially tropical Neotropical family. Of a total of about 120 species, only some 50 breed mainly in the[4] [12] United States or Canada the rest being confined to the tropics. Migration evolved as a means by which some members of the family could exploit a seasonal niche which became available as the glaciers receded. Thus the true "home" of our warblers is really in the tropics, and they are only temporary visitors here in the summer.[11]

Table 2 shows other families of landbirds which include species breeding in the prairie provinces and wintering in the Neotropics.

The land area of North America south of the tree-line is approximately four times that of the three wintering areas mentioned above, combined.[8] Thus the birds are more concentrated on their wintering grounds than on their breeding grounds. The importance of these tropical areas to our breeding birds is obvious.

Yet tropical forests are being destroyed at an alarming rate. 27.5% of the mature forest in the wintering areas was destroyed between 1955 and 1970.[8] Figure 1 shows the amount of dense forest in Costa Rica in 1940 and 1977. Costa Rica probably has one of the best records for conservation in Latin America.

There are a number of reasons for the destruction of the forests. Latin America has one of the highest rate of population growth in the world — in South America 2.7% annually and in Central America 3.3% annually.[5] The birth rate is two and one-half times greater than that in Canada.[5] The increasing population needs to clear more land for food production and housing.

Perhaps more important is the change which is occurring in land use patterns in the tropics. Traditionally, peasant farmers used a slash and burn type of agriculture. A small area of forest would be cut, burned once dry, then planted to crops. Because of the low fertility of most tropical soils, the resulting clearing could be used to grow crops for a few years only. Then it would be abandoned and natural succession would occur, while the farmer moved on elsewhere. Thus a continuous source of successional forest would be available to the birds.

Now, however, the small farmer is disappearing and the land is more likely to be planted to bananas or turned to pasture once cleared, and managed by a large agricultural company. Habitats of this type are much less attractive to most birds. Frequently the soil is not fertile enough to sustain such intensive use for long. Heavy seasonal rain may leach nutrients from the unprotected soil and serious erosion may occur. The area may soon become a wasteland, of use neither for agriculture nor as wildlife habitat,[14] (and pers. obs. in several Central American countries).

We may be making a personal contribution to this destruction by buying fruit or beef imported from tropical countries.

Table 1. MIGRATION AND WINTERING OF THOSE WARBLERS THAT REGULARLY BREED IN MANITOBA

Species of Warbler	*USA*[10]	*Mexico*[9]	*Costa Rica*[13]	*S. America*[6]	*W. Indies*[1]
Black-&-white	W[b]	W	W	W	W
Golden-winged	T[a]	T	W	W	W
Tennessee	T	W	W	W	T
Orange-crowned	W	W			
Nashville	T	W			
Parula	W	W			W
Yellow	T	W	W	W	W
Magnolia	T	W	W		W
Cape May	T				W
Yellow-rumped	W	W	W		W
Black-throated Green	T	W	W		W
Blackburnian	T	T	W	W	T
Chestnut-sided	T	T	W		T
Bay-breasted	T	T	T	W	T
Blackpoll	T			W	T
Pine	W	W			W
Palm	W	W			W
Ovenbird	T	W	W	W	W
Northern Waterthrush	T	W	W	W	W
Connecticut	T			W	T
Mourning	T	T	W	W	
Common Yellowthroat	W	W	W		W
Wilson's	T	W	W		
Canada	T	T	T	W	
American Redstart	T	W	W	W	W
No. wintering species	7	16	15	13	14
No. transient only	18	6	2		6
Total species found	25	22	17	13	20

[a] T . . . occurs only as transient

[b] W . . . winters. Other individuals may be transient.

Whether this habitat loss will affect the populations of birds breeding in the prairies will depend on a number of factors. There is controversy as to whether population is limited on the breeding grounds or wintering grounds. That wintering could limit populations was shown by the catastrophic decline in breeding populations of some species of Old-world Warblers (Sylviidae)

Table 2. MAIN FAMILIES OF PRAIRIE PROVINCE LANDBIRDS WITH MEMBERS WINTERING IN THE TROPICS.

Family	*Example*	*Wintering Area*
Accipitridae	Swainson's Hawk	Virtually all winter in the pampas of Argentina.[2] Concentration in the narrow isthmus of Central America provides a spectacular sight.
Falconidae	Peregrine Falcon	Winters south to Chile. In tropics may ingest pesticides (banned in USA and Canada) which interfere with reproduction.
Charadriidae	American Golden Plover	In fall, adults fly south over the Atlantic Ocean to South America. In spring, they follow the land, as do immatures in fall.
Scolopacidae	Semipalmated Sandpiper	Winters from Gulf coast of US to S. America
Cuculidae	Black-billed Cuckoo	S. America
Caprimulgidae	Common Nighthawk	S. America
Apodidae	Chimney Swift	S. America
Trochilidae	Ruby-throated Hummingbird	Central America, southern US
Tyrannidae	Least Flycatcher	Most species winter in the tropics, the Eastern Phoebe in S. US
Hirundidae	Barn Swallow	Central and S. America
Turdidae	American Robin	Despite the scientific name (*Turdus migratorius*) many go no further than northern US and may winter here. Thrushes of the genus Catharus winter in Central and S. America.
Vireonidae	Red-eyed Vireo	S. America
Parulidae		One of the most highly migratory families. See Table 1.
Thraupidae	Scarlet Tanager	Basically a Neotropical family with only 2 members breeding in our area.
Fringillidae	Rose-breasted Grosbeak	W. Indies, Central and S. America. But most finches are much less migratory.

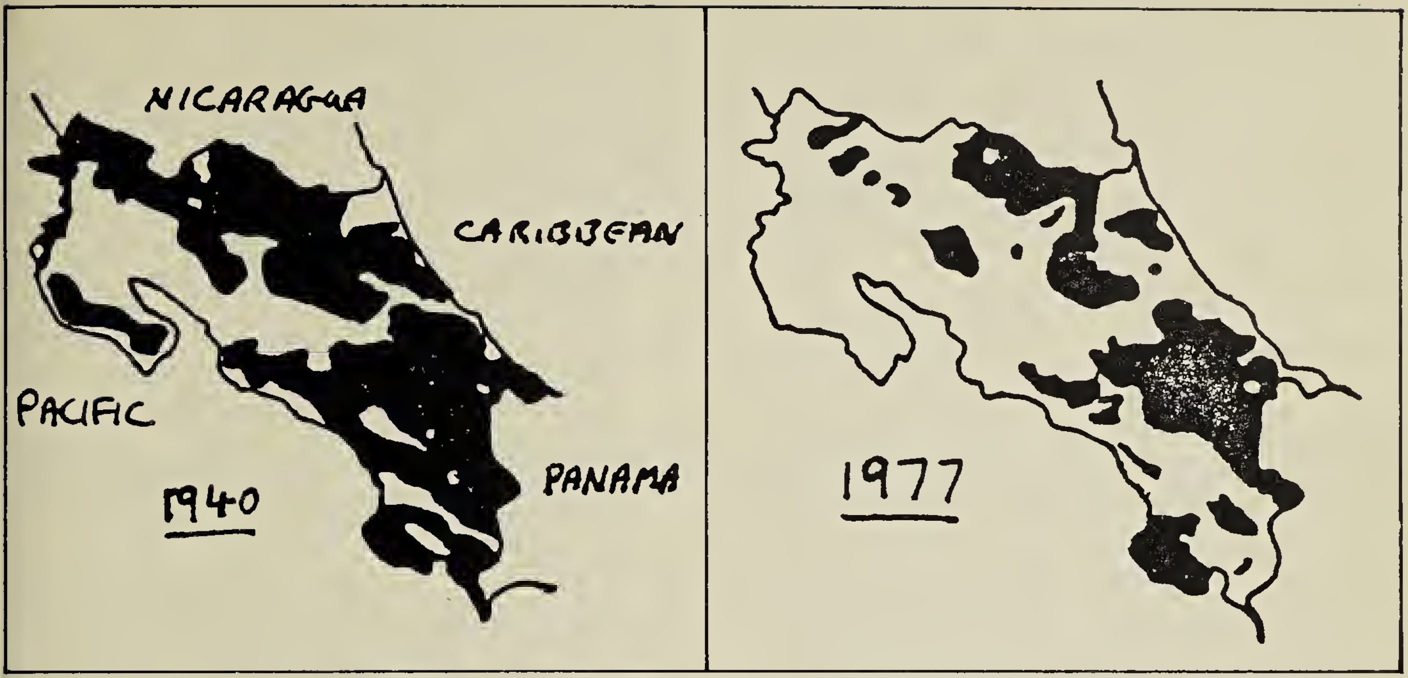

Figure 1. *Dense Forest (over 80% ground cover) in Costa Rica 1940 and 1977. Source: Organisation for Tropical Studies, San Jose, Costa Rica.*

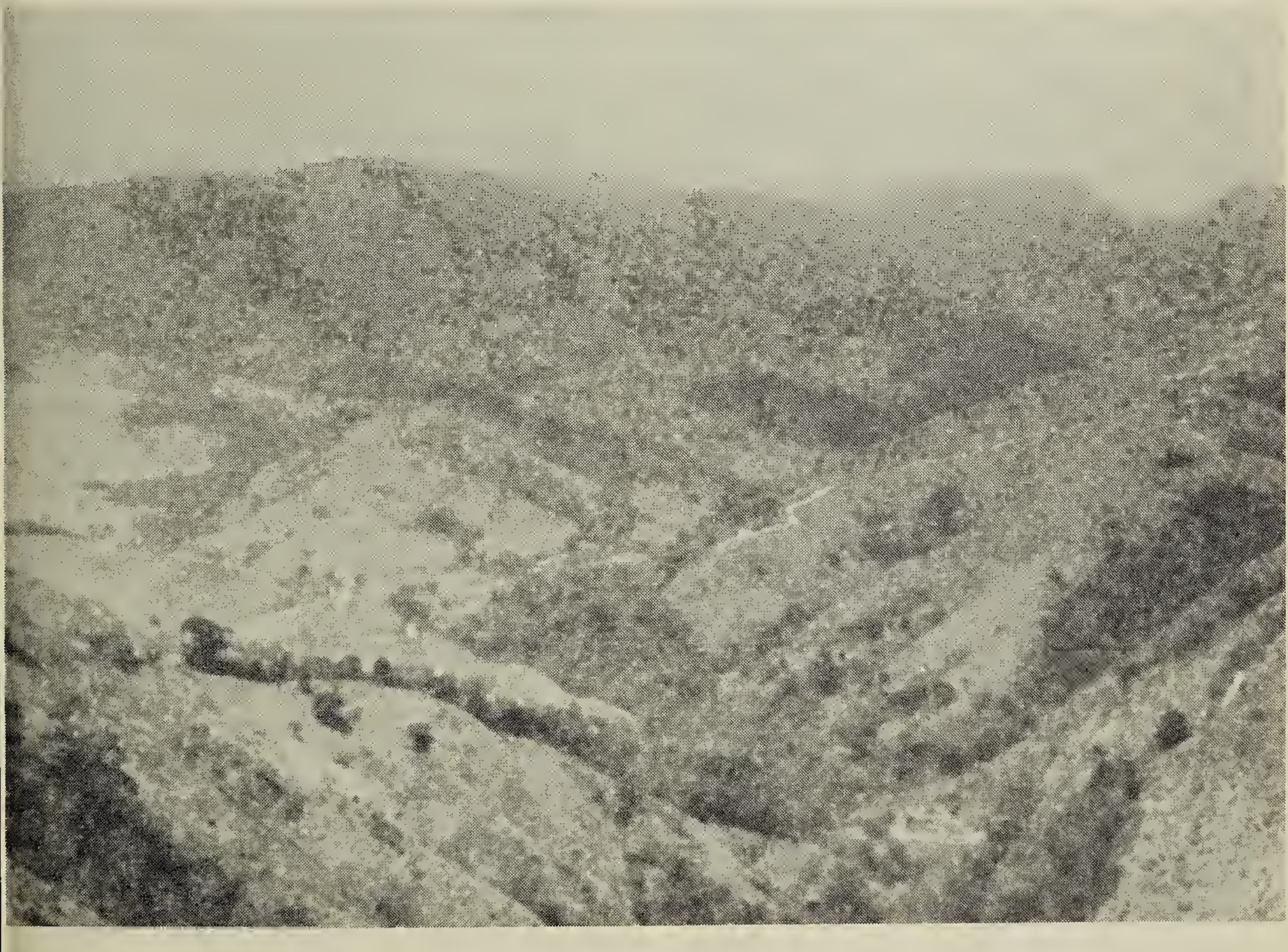

Figure 2. *Land which has been cleared of its natural forest cover and is now used for grazing. Provincia de Guanacaste, Costa Rica, Central America.*

Photo by R. Grimshaw.

following a drought on their wintering area.[8] On the other hand, Bay-breasted and Cape May Warblers have been shown to fluctuate in total numbers in response to increased breeding success during spruce budworm outbreaks in northern forests.[7]

Perhaps there is a balance or equilibrium, which could vary from species to species. An increase in breeding success could make wintering ability the limiting factor. Conversely, more successful wintering could make breeding the limiting factor. Populations would be stable over the long term, although major habitat or other changes could shift the balance in either direction.

Another important factor is the type of habitat used by migrants while in the tropics. Do they need primary forest, or do they prefer edge or second growth which might be increased by certain types of forest clearing? Apparent differences in numbers of migrants recorded from different habitats may reflect the ease of seeing the birds rather than real differences in usage. It seems likely that those species using successional and edge habitats on their breeding grounds will also do so in winter, while other species will stick to primary forest.[14]

Clearly, much research needs to be done in the tropics to clarify some of these problems. However, it is also important to census the birds on their breeding grounds. By doing this accurately and over a long period of time, population changes may become apparent that have their origin in habitat changes in the tropics.

It is to be hoped that there will be increasing habitat conservation in Latin America. Not only will this help preserve the resident biota, but also provide for the many species of birds which breed in higher latitudes and return to their ancestral homes for the northern winter.

Acknowledgement

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FURTHER EVIDENCE FOR A HISTORIC POPULATION OF PEREGRINE FALCONS IN SOUTHERN SASKATCHEWAN

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I recently reported evidence for an extension of the historic breeding range of the Peregrine Falcon (*Falco peregrinus*) into southern Saskatchewan and Manitoba.[1] I have since discovered three additional historic nest records for this species from Saskatchewan which further support this range extension.

Having completed a search of the 20 largest bird egg collections in North America,[2] I have found that, in addition to the previously reported 1916 nest record of J. E. Bowman in the collection of the Western Foundation of Vertebrate Zoology, collections of the Field Museum of Natural History (Chicago), Carnegie Museum (Pittsburg), and American Museum of Natural History (New York) contain three more historic Peregrine nest records all collected by J. E. Bowman near Battle Creek, Saskatchewan. Apparently, Bowman also made collected trips to Battle Creek in 1914 and 1917 where he collected three sets of Peregrine eggs. Each nest contained four darkly colored eggs typical of Peregrines. One nest was found on 3 May 1914 on the shelf of a 25 m cutbank 5 m from the top. The other two nests were found on 19 May 1917 on the ledges of 10 m cutbanks 3 and 5 m from the top.

None of Bowman's records include specific information on nest locations, so he may have collected eggs at the same nest site all three years. Because he collected two egg sets on the same day in 1917, however, I think one can safely conclude that there were at least two active eyries in southern Saskatchewan at that time.

Acknowledgements

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Prairie Falcon *R. E. Gehlert*

FURTHER OBSERVATIONS OF VARIATIONS IN BIRD NESTING HABITS

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During the past three years I have noted further variations in nesting habits of some perching birds in the vicinity of Whytewold on Lake Winnipeg.[1] Examples are as follows:

WESTERN KINGBIRD

In 1981 I found a nest with string woven into various plant fibres and it was bound to the branch of an oak tree with string. Close to the nest a thin long narrow strip of red material hung down from the branch.

In 1981 another bird had woven into grassy fibres a great deal of nylon string from old fish nets. The usual composition is ". . . grasses, hair, wool, and various fibrous materials . . ."[4]

EASTERN KINGBIRD

One nest was constructed mainly of wool-nylon yarn (medium blue, pale blue, and white) with just enough plant fibres to bind the yarn together.[3] The usual composition is ". . . twigs, grasses, dry grasses and plant fibres."[5]

In 1981 I observed, for the first time, a nest on the branch of a spruce tree 4.8 m from the ground.

BLUE JAY

This species sometimes uses a little paper in its nest construction.[5] I watched one of these birds pick up from our yard several strips of white toilet paper 10 cm by 30 cm. It carried them about 45 m away to build its nest 5.4 m up in an oak tree. (It used some twigs and grassy fibres also.)

NORTHERN ORIOLE

In 1981 one female picked up mostly white string to weave her nest, which was about 9 m above the ground, in an aspen poplar in our yard. She picked up several 20 cm lengths at a time, but did not touch any pieces of woolen yarn.

Another female didn't pick up any white string, but chose to use various colours of wool-nylon yarn which I had scattered about the yard for nest building purposes. She did not use any of the red yarn.

Two nests were composed of a great deal of nylon string from old fish nets. The usual composition is "plant fibres, hair and twine . . ."[6]

YELLOW WARBLER

Six nests in trees were from 4.5 to 10.5 m above the ground. The nests of this bird are "most often 0.9 m to 2.4 m up but rarely as high as 12 m" and construction is of "plant fibres, grasses, shredded bark, sometimes of twine or cotton wool."[5] I have found that various man-made materials are now being used, such as kleenex, paper, white string and also very thin strips of clear plastic.[2]

AMERICAN ROBIN

Many nests of this species have white string and/or kleenex woven among plant fibres and grasses. In 1981, there was an unusual nest one side of which was covered with a fairly large piece of aluminum foil and a clump of white paper. This nest was built in the crotch of the trunk and an upright branch of an oak tree.

LEAST FLYCATCHER

A nest of this species was fastened to a horizontal limb of an oak tree 7.5 m from the ground. Several pieces of white string and strips of yellow kleenex were woven with some plant fibres.[3] Usually the nest is a "compact, deep cup, well made of bark, weed stems, grasses, etc. . . ."[6]

EASTERN WOOD PEWEE

On many occasions I have watched these birds build a second nest in the same season, due to predators, but in 1981 I observed the same female build 4 nests in different oak trees; two were in our yard and two were in close proximity to our property. Each time she began to incubate a predator must have disturbed the nest. She commenced to sit on the fourth nest on 21 July. At no time did I see her take any material from the unsuccessful nests, but she persevered with the arduous task of collecting silken webs, lichens, and fine grasses, taking a week to build each nest.

CATBIRD

One nest was located in an oak tree entwined with Virginia Creeper and situated 3 m from the ground. It was composed mostly of plant fibres, grasses, two small pieces of white paper, and a little plastic.[4] Usually the nest of this bird is "in thick shrubbery . . . between 0.9 m to 2.4 m above ground . . . made of twigs, weed stems, grass and leaves."[5]

In 1981 another nest in an oak tree was on a lower bare branch 1.5 m from the ground. The oak tree was surrounded by hawthorne and hazelnut bushes. (This nest was composed mainly of twigs.)

It is very interesting to find that each summer brings with it new observations in bird nesting habits.

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TUNED IN AND TURNED ON

BRADLEY J. MUIR, 24-80 Hanbidge Crescent, Regina, Saskatchewan. S4R 6N2

Last summer I was part of the team of naturalists interpreting the natural and human history of Prince Albert National Park. While I was working at the park nature centre one drizzly afternoon in July, a pair of excited visitors urged me to follow them outside. Unsuccessfully bridling a child-like enthusiasm, they soon acquainted me with object of their attention. A gray-brown bird somewhat less than robin-sized hopped toward the steps of the building. It was a Brown-headed Cowbird acting in a quite unexpected manner.

I crouched for a closer look and extended a curious hand. Paying little attention, the bird busied itself foraging for bits of leaves and seeds. It deftly snatched up the membranous wing of a dead damselfly and gobbled it down.

Absolutely unafraid it waddled through our legs and over our toes. When approached the bird neither flinched nor shied away but hopped through the arch created by my leg as I knelt. At first I thought this might be a young or injured bird and hence flightless. However, after five minutes of wandering through the gathering crowd it flew without difficulty into an aspen, then over the top of the nature centre. I never saw the bird again that summer.

Birds like the Gray Jay and Clark's Nutcracker are often unafraid of humans and are rather bold. Still they exhibit a degree of caution when robbing food from picnic tables or scavenging in trash cans. A foray into the bird's "safety zone" elicits an avoidance response, one the cowbird did not show. It acted as if it knew it was unthreatened by people, and indeed no one was about to cause it harm. The confrontation would have been different (and probably fatal for the cowbird) had a fox or domestic dog or cat been present. The survival value of such nonchalant behaviour must be very low.

Even without attempting to answer the questions posed by this unusual bird behaviour, I felt that the observation was of intrinsic value. I decided it was a time to say very little. To appreciate nature, it does not always take a script-perfect presentation, audio-visual aids, or even an attempted explanation.

Perhaps a collection of first-hand experiences similar to this cowbird observation might foster a better understanding of nature on the part of the ordinary person. The resulting appreciation and concern could influence people when they are asked for their opinion, or to allocate funds or cast a ballot on an environmental issue. It could start people on the road to being "tuned in and turned on" to natural environments.

MAGPIE ATTEMPTS TO CAPTURE MOUSE

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On 3 January 1982, while driving along a grid road northwest of Maidstone, Saskatchewan, Sheila Lamont and I watched a Black-billed Magpie flying over a field towards the road. As it crossed the road it suddenly plunged into the ditch out of our view behind an approach. After two or three seconds it re-appeared carrying a dark object in its bill which it dropped after flying a few feet. The magpie plunged back into the ditch, retrieved the object and again dropped it. It appeared as if it was going to plunge after the object once more but was frightened away by our approaching vehicle.

Curious as to what type of "garbage" the magpie had been trying to carry away I stopped to investigate. To my surprise I saw nothing in the ditch. Closer examination found tracks which revealed that a mouse had come out of a small tunnel and was running along the ditch when the magpie captured it. The mouse tracks re-appeared about four feet along in the ditch and again disappeared only to re-appear again. The mouse tracks then led to a tunnel where it had apparently burrowed back under the safety of the snow.

The tracks appeared to be of a Deer Mouse (*Peromyscus* sp.) but I am not certain of this identification.

Although the Black-billed Magpie is known to be a very opportunistic feeder, I did not expect one to attempt to capture live prey the size of an adult mouse.

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